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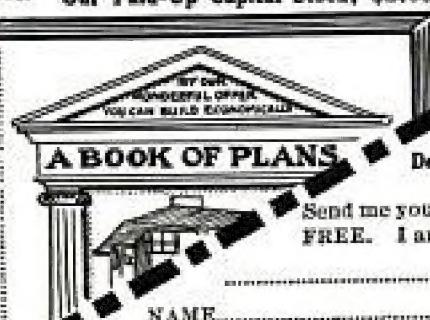
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(Feb. 12, 1912.)

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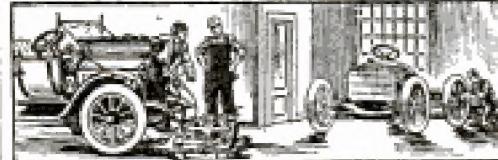
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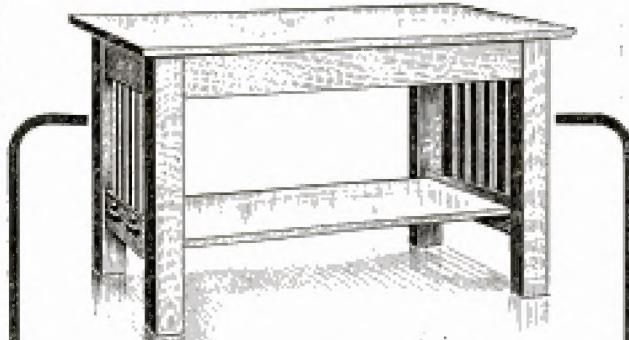
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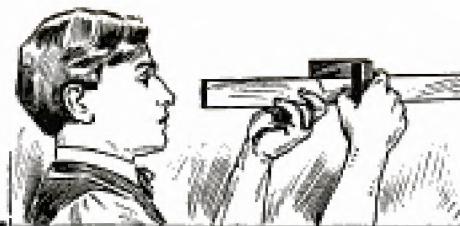
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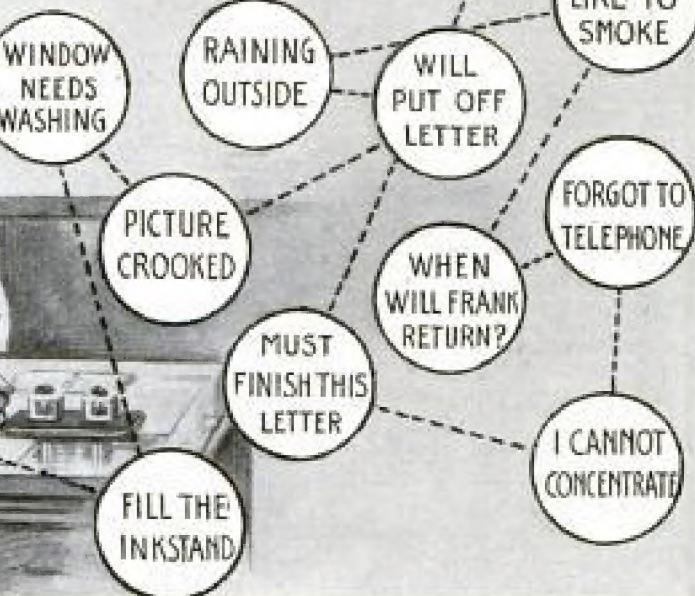
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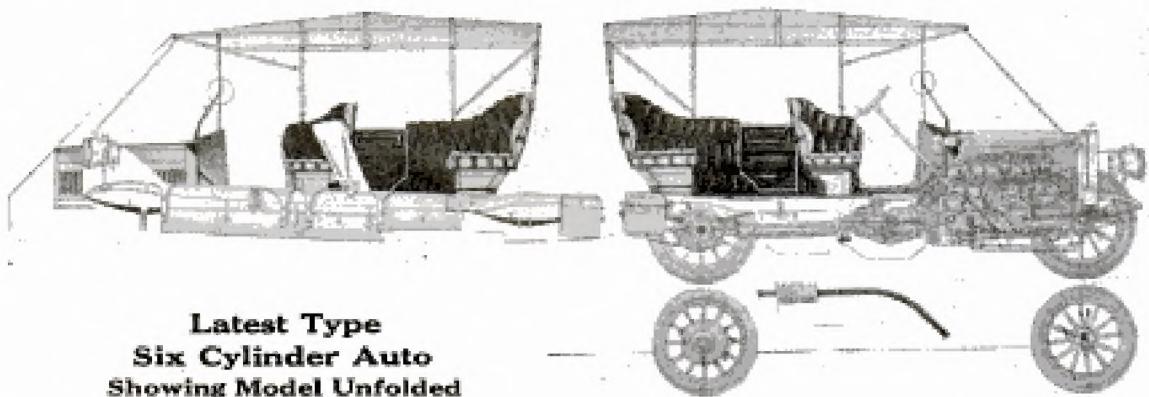
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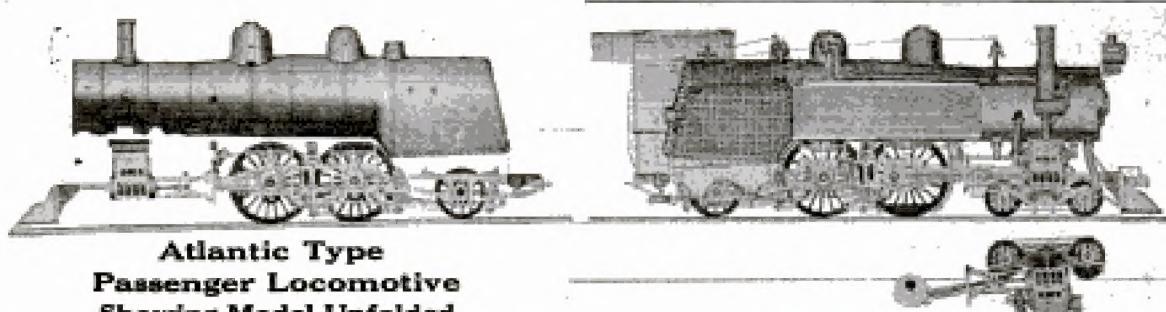
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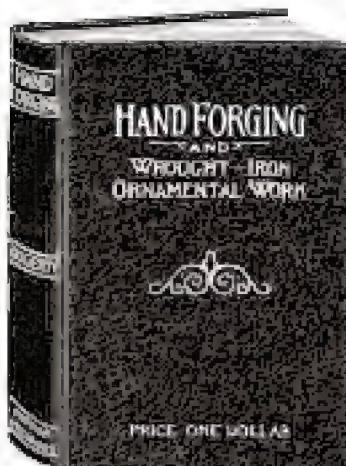
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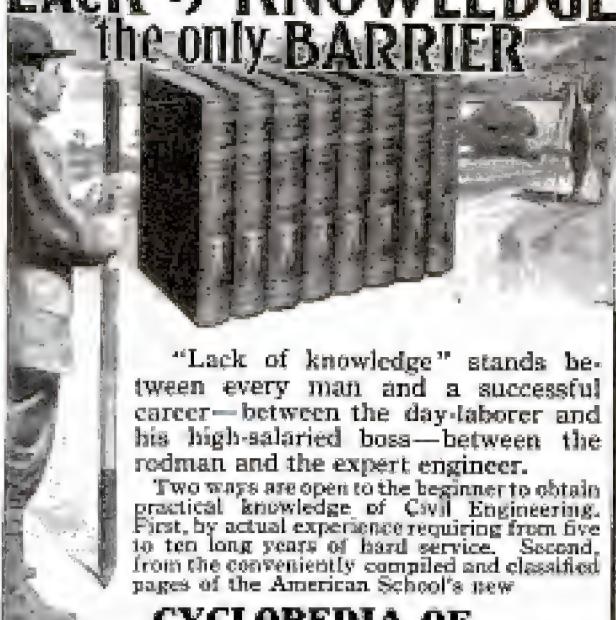
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AGENTS make 50% profit selling our solid window frames, novelty signs and changeable signs. \$10 varieties in enormous demand. Confidence free. Ballouan Co., 1238 Van Buren St., Chicago, Ill.

WANT a fine tailor-made pull? Show our samples to three friends, take two orders easy and make enough to get your suit free. Young men's styles; very low prices, your profits maximum. Shipped on approval, express prepaid, perfect fit guaranteed. Good agents wanted everywhere; no money or experience needed. Write for free sample outfit and great offer. Bauer Tailoring Co., High St., Chicago.

SIGN will offer. Send name and address for transferable suit offer and outfit to start, samples, robes, etc. We want live agents. Can make \$1,000 to \$5,000 a year. All business your territory turned over to you. We pay all express charges. Only one suit offer to your town. If you want a suit within quick before someone else gets it, write price. Margolin Tailoring Co., Dept. 1192, Chicago, Ill.

200% PROFIT selling the Judy Art. The demand is enormous. Buy large savings; "Received Art" sold 5 in fifteen minutes. Best ever, exclusive features. Sewn quick and strong. Lowest price, biggest profit, greatest value. Write quick for my proposition. W. S. July, Mgr., Dept. 12, Dayton, Ohio.

AGENTS—Don't squander your money on hot air and blue sky relatives. Get something practical and a money getter. Particulars free. Finley Mercantile Co., 120 North Jackson, Houston, Illinois.

AGENTS—\$25 a week for 8 hours work a day. A brand new industry proposition that beats them all. Write for terms and free sample if you make mistakes. Guaranteed. Hester Co., 1092 Third St., Mayfield, O.

AGENTS. Success begins success, not \$5.50 per hundred cigar is the consumer gets business every time, costs you \$1.50, will soon sell them out. Walton Company, Head Building, Philadelphia.

AGENTS—Sell Liquid Vulcanizer outfit to automobile and motorcycle owners or garage houses. Will repair existing made of rubber. Is not an oil. Liberal commissions. J. K. Gumpert & Son, 1651 Commercial Bldg., Dixie, O.

HUSTLER—Man or woman; the steady, duty Summer months increase the great demand for Tate's dust-absorbing articles; get agency now. J. Supply Co., Box 1108, Boston, Mass.

AGENTS to sell Mytek Sprays. Disinfectant, and murders bedbugs, fleas, flies, etc. My tek. Mytek Chemical Company, Buffalo, New York.

AGENTS—Men and women; sell Guaranteed Money. Credit plan helps you. The line that repeats. Exclusive Agency to Hustler. Address D. L. Lehr Mfg. Co., Denver, Colo.

BIG profits for you! Magnifique Harley Cycles. New confection. California luxuriant. So perhaps costs you to Machine, instructions complete. \$7.50 prepaid. Samples 10c. Shaver Co., 1013 Howard St., San Francisco.

AUTOSOONIE the patented. Agents wanted. Our protectors are sold off 30 days trial. Every automobile owner easily interested. A permanent and prosperous business can be built up by a good man. Send for particulars. Leather Tire Goods Company, Niagara Falls, N. Y.

AGENTS—live men are ruling money with our outfit, which doubles the life of auto tires. Write us. Lakeside Importing Co., Minneapolis, Minn.

FREE—Safety Razor, Mountain Pen—other valuable premiums. Just a few hours spare time. Particulars free. Em-Co., P.O. Buffalo, N. Y.

AGENTS—*"How a Boy Can Make You Rich"*. Set of 4 books that sell for only \$3. Everyone is interested. Enough to keep a boy busy until he grows up. Parents want them for their kids. Good liberal commission. Exclusive territory. Write to Popular Mechanics, Brook Dept., 51 W. Washington St., Chicago.

MANAGER wanted every city and county, handle best paying business known. legitimate, new, exclusive control, no insurance or book advertising. Address Chas. P. Holstein, 42 West 8th St., New York.

AGENTS—\$15 to \$50 a week. The veg pocket cost and hat hook sells at night. Easy work. Big profits. We bring sample and terms. Lynch Mfg. Co., 1824 Scott St., Wilmington, Del.

IDEAL Mail Box. The best sanitary, sanitary Mail Box manufactured. New design, patented. Valuable Premiums. Write for sample and big free Catalogue. Unlimited opportunity for agents. Sample Box, prepaid, H-23. Standard Sales Co., Buckingham, N. Y. R. 2.

AGENTS wanted to sell our Metallic Gold and Silver Letters. Up to date. Big demand everywhere. Flexible Letter Co., 436 East 12th Street, New York.

AGENTS—you will be interested in a postal card will bring you a \$15 to \$60 a week proposition. American Aluminum Company, Division 1, Louisville, Ky.

AGENTS—Be the first to sell our "Just-the-Thing" Eric Strader's brand new invention; great Summer and Fall seller. J. Supply Co., Box 1105, Boston, Mass.

AGENTS opportunity. Three fast, profitable sellers. Patented. Postal Insignia Pictures. Newsline Co., 219 S. Dearborn St., Chicago, Ill.

AGENTS wanted everywhere for new selling \$5 proposition. \$25 daily easily made. Particulars free. The Key Specialty Co., Box 18, Westford, Mass.

HUSTLING Agents Wanted for our fast selling Sanitary Household Brushes. Steady work. Big profits. Postal brush particular. Dept. C. Hale & Karranek, New Britain, Conn.

SELL dry goods remnants. We can start you in new, profitable business. Remnant Store, Dept. 14, Cincinnati, O.

AGENTS—Want a real selling article. The Better Specialists, 729 Linden Street, Fremont, Ohio.

WATER strainer casting Co. sells The Detroit Filter Co., Detroit, Mich.

AGENTS—Best propositions, great money-maker. Sample free. Steiner, 431 A, S. 15, Newark, N. J.

AGENTS—Streetcars, 12¢ weekly, running key-ring串珠锁. In one. Lighting seller. Sample 10c. A. Peers, Bradley Beach, N. J.

If \$1.50 to \$6.00 per day seems good to you—then ours. It's something different, and "worth while." A postcard will do. Burton Fisher, Camden, New York.

\$52 MONTHLY and expenses, no experience needed; position permanent; self-seller. Price Mfg. Co., Dept. 26, Cincinnati, O.

AGENTS (either sex) for New Patent Household necessity, quick seller. M-14, Box 456, Atlanta, Ga.

MADE yourself independent by selling mirrors. Send for booklet. M. E. Thompson Co., Dept. K, Akron, Ind.

MEN or women to sell Mine. Delleches Oriental High Grade Toilet preparations. Big profit. M. Dewan, 14-16 West 3rd St., New York.

AGENTS—See our proposition, big profits, particulars free. Night Smellor Co., Box 72, Gable, Oregon.

FORTRESS Agents. For good work write to W. J. Bennett, Chicago, Ill.

AGENTS—Deputy, costs to sell for \$5 to \$1. Sample free. Thurber Laboratory, Fonda, Ia.

AGENTS to represent manufacturer. Inter, Waycross St., Buffalo, N. Y.

EARN \$15 to \$25 a week or more as our Mail Order Dealer. High from your own home. Hold your position until entire time is required. We are manufacturers and owners of patented just-in-season specialties. If you are just starting a Mail Order Business or if already established, you can't afford not to handle our Patented Money-Making clothes. We sell exclusively to our Mail Order Dealers. We protect them. We carry stock and furnish advertising. No canvassing. Small capital. Experience unnecessary. Write today for latest Patented Dealer and Manufacturer's Best Selling Mail Order (catalogued) plan backed up by "Whole Truth," Positive Proof and Strong Statement. J. M. Peace Mfg. Co., 525 Peace Blk., Michigan St., Buffalo, N. Y.

AGENTS wanted everywhere. See the Treatment of plasticine tires, seals all punctures automatically. Written "Money Back" guarantee makes big sales. Average sale \$15; large guarantees. Biggest selling automobile proposition on the market. Get in touch with us at once and get the facts. Exclusive territory granted. No investment. Free samples. Berlin Tie Co., Dept. 42B, 140 Michigan Ave., Chicago, Ill.

YOU sales guaranteed. Sample free to hustlers. Men buy on sight. Only device that scientifically houses and stores any man—old style or today. Gives instant diagonal stroke. Famous Bubbletum Heating Stop in every machine. Sold on money-back guarantee, 100% profit. Write quick. Int. particulars. Sales Manager, 721 Victor Bldg., Clinton, Okla.

If an agent should show you our new diagonal stroke safety razor, you could be most buying it yourself. It looks so businesslike and is so unusual. Its mathematical precision and beautiful finish make an irresistible appeal. It is a click to sell. Write for illustration and terms. Twin Blade Safety Razor Co., 8 Church St., New Haven, Conn.

IMPERIAL Electric lamp shades, beautifully illuminated in colors, electric bulbs, stone windows, cases, picture, ball rooms, new, beautiful genuine soils everywhere. Agents opportunity; sample 10c, three assort'd colors. G. C. 1901 Century Equipment Co., 10 Nassau St., New York.

TWO crockerick sellers. Prices Before Pipe Cleaner, Aluminum Plant or Clothes Sprinkler; samples 10c, both 25¢; guarantees free. George Hunter, Yonkers, N. Y.

You are looking for more long green. Tax about deserve it, and willing to work for it. Our soap and toilet article combinations, have every combination of having the real Colgate Gelters—no one prime than they are. Write for our advertising brochures. Perris Soap Works, 64 Davis Bldg., Chicago.

JEWELRY Diamonds—Agents, everywhere, to wear and sell our famous Bohemian Diamonds. Write for sample offer and catalogue. Free. Northwestern Jewelry Co., 54 Northwester Bldg., Chicago.

SALESMEN making small towns, just what you want for pocket sideline. Something new, sharp and catchy. Quick shipments, prompt commissions. State territory covered. Write for order booklets. Ward Mfg. Co., 212 Steel St., Chicago.

AGENTS—Our new No. 100 Steel Mangle. Fastest seller on market, fits all lamps. Converts kerosene into gas. Safe, reliable. Guaranteed perfect white light. Sample burner postage paid. Lyndhurst Burner Co., Dept. B, Lyndhurst, N. J.

LARGE steady income; no investment, you cannot lose a cent. Become our country or city Sales Manager in your own locality. Unlimited sales. Experience unnecessary. Handbooks printed every week. Lamb Sales Co., Post Scott, Kan.

TRAVELIN'CO self heating hot irons. Guaranteed. General agents and local sellers wanted; exclusive territory; unlimited money back guarantee; heats without explosives; no oil, gas, gasoline; alcohol, electricity or charcoal; no smoke, fumes, or dust; fuel cost 5¢ day; retails, \$3.50. Agents samples, \$2; every woman wants it. Mfg., 300 Keystone Bldg., Pittsburgh, Pa.

FORTRESS Agents, 1000 Crates, Repls. Passline, Banquet 40 cents. Big money in our canvas portraits. Delivery guaranteed or money back; portrait and frame catalogue and sample free. Standard Portrait Co., Dept. P.M.2, 5219 Ellis Ave., Chicago.

MR. Agent may we interest you in three of the best selling and most profitable articles ever offered. Would 40% profit make you "take notice"? For samples close up package. United Sales Agency, Franklin, Pa.

AGENTS wanted everywhere for easy selling \$5 proposition. \$25 daily easily made; particulars free. Park Specialty Co., Harris, Iowa.

LOCAL representative wanted in every town; profitable opportunity with promising future; this article will guarantee satisfaction; expenditure unnecessary. It commands instant attention. Write today for free particulars. Collier Co., Dept. M, 321 Michigan St., Grand Rapids, Mich.

AGENTS: Just out. Handsome steel clothing clothes like red tortoise shell strong line free. Sample Inc. Liberal commission. Sells on sight. Plaza, Box 242, Brooklyn, N. Y.

WONDERFLY, Luminous Crucifix—Shines in a mysterious light all night in the darkest room. Agents delighted. Catalog free. Cathedral Supply House, 28 Clinton St., Chicago.

WANT agent. Honest man or woman to represent large wholesale firm. Experience unnecessary. Easy, pleasant work. Fair salary to start. Peoples Supply Co., P-22, Kansas City, Mo.

BEAUTIFUL, embossed gold shadow letters, make 100% profit without experience. Signs always needed. Ours last for years. Rock bottom prices. Essential to work with mailed free. Embossed Letter Co., 2194 Milwaukee Ave., Chicago.

AGENTS—Don't send money anywhere until you write for our proposition and sample. Thomas Supply Co., Dept. P, Pensfield, Mass.

PICKET lighter for cigars, auto, etc. See, self-lighting matches. Sc. Sparkler, lights all gas, much safer and cheaper than matches. Sc. Wizard for stoves and lights. Sc. Agents don't pass this. Thompson-Tucker Specialty Co., Elmira, N. Y.

AGENTS—Just mail \$1 self heating iron. Greatest dollar article. Write or wire for territories and particulars. The Larson Mfg. Co., 2013A Pleasant Place, Chicago, Ill.

SMALLER Alarm Clock. 10¢ prepaid. W. H. Garnet, 110 South LaFayette St., Elkhornville, Ind.

ROOSTER—the magazine you need. Send 10¢ for the month trial. Beader Magazine, 306 Northwestern Building, Chicago.

CUT out girls and babies. Handle sensible, safe-life, guaranteed merchandise. Send for catalogue and unique selling plan; experience unnecessary. Lynn-Killim Mfg. Co., East St. Louis, Ill.

AGENTS—Cost 2c, sell 25c. Windsor letters you can put on with roller. Postal letters free mounted samples. Ward Letter Co., 2569 Milwaukee Ave., Chicago.

LOW PROFIT selling our stan letters. We'll show you how. 10¢ varieties; sample free. Johnston Co., Quincy, Ill.

AGENTS—New household article; sells itself. S. A. Brown, Buffalo, N. Y.

AGENTS—Our specialties sell at sight; great for repeat orders; no experience required. Catalog free. John H. Head, Dept. 19, Aurora, Ind.

AGENTS—Our Sun-Egg Incandescent incandescent incandescent incandescent. Guaranteed. Best cost market; 150 candlepower light. Galion Kerogen 160 hr. hours. Particulars free. Singlex Gaslight Co., Dept. P, New York.

PORTFOLIO agents look our photo books all others. Prompt shipments—reports credited. 30 days' credit. Catalogue of Portfolios, Frames, Pillow Tops, Sheet Pictures and samples free. James C. Bailey & Co., Dept. K, Chicago.

ASTRA Diamonds—Everybody's wearing and selling them. Agents terms and catalogue free. Astra Company, 2 West Chicago Avenue, Chicago.

AGENTS—Our patented specialties sell like wildfire; send for free catalog and sample, worth 10c. General Mfg. Co., 321 S. Lawrence St., Philadelphia, Pa.

AGENTS—Sun-paints. Cost 2c, sell 25¢. Something new. Guaranteed. Sign Letters mounted with kerfing and roller. Grip cost free. Ross Letter Co., 2407 Milwaukee Ave., Chicago.

AGENTS—Earn big money and establish permanent business right at home as distributing Agent in your country for large manufacturers toilet soaps, perfumes, etc. Write quick. Jesse M. Davis, Sales Dept., P. Indianapolis, Ind.

HIGH-PROFIT profits selling agencies. Write today. E. C. Smith, 1129 No. State St., Birmingham, Ala.

AGENTS are successful handling our automatic sugar separator—easy selling—saturation guaranteed. Returns \$1.50. Profit 100%. Write for terms. Auburn Supply Co., 7416 Prairie St., Chicago.

HUSTLERS are making big money with the Fuller—the best and quietest selling line of sanitary household brushes made. Write now. Catalog free. Sample outfit. Fuller Brush Co., 38 Hanover Place, Hartford, Conn.; Western Branch, Wichita, Kansas.

AGENTS—Make \$5 daily taking orders for door plates, name plates, house numbers, signs, etc. Samples free. Brett Bros., Boston, Mass.

CASH for names, addresses, information, etc. Steady income at home. Instruction booklet for stamp. Information System, 227, Mayfield, Ohio.

AGENTS—\$50 weekly; no manufacturing the best needle case made; a wonderful seller; 200 to 300 per cent profit; talking unnecessary; our copyrighted "Trust Scheme" guarantees do the work; general agents can make over \$100 weekly; send for a 25c sample containing 115 needles; particulars free; buy direct from the factory at wholesale. Italy Needles Co., 102 Union Sq., Somerville, Mass.

AGENTS—County and State; men and women everywhere to sell the Pinless Clothes Line; a practical false spring linencase, lasts life-time, sells on sight, gives perfect satisfaction. Agent Sultan of Georgia, sold over million feet; 100% profit; write quick for exclusive territory; information free; sample prepaid for stamps. Pinless Clothes Line Company, 520 Wilcox Bldg., Portland, Oregon.

AGENTS—Ladies or gentlemen, to sell the highest grade infant goods, garments, etc., direct to families. High class infant-fare dealing; repeat orders sure; large cash commissions. Address Kingley Bros., Indianapolis, Ind.

MAIL order ads that pay. 20 different propositions fully explained. All bona fide, sure-fire Money-makers. Each one the foundation of a successful Mail Order business. Send 10c for full particulars and regular bulletins of new propositions. Mail Dealers Wholesale House, 458 Franklin Bldg., Cincinnati, III.

AGENTS—We manufacture glass paper, plain glass windows made to look like real stain glass; something new; easily applied; big money maker; two sample sheets of paper, with catalogue in colors and discount sheet, for 10c. E. H. Passik & Co., 202 S. Clark St., Chicago.

AGENTS are making \$50 a week selling Steel Mantle Lamps and lantern mantles. Sample burner mailed to your address for 25c. Particulars free. Steel Mantle Lamp Co., 209 Huron St., Toledo, O.

YOU can make \$50 as our general or local agent. Household necessity; saves 80 per cent; permanent business; exclusive territory; salary or commission; free sample; credit. J. Pfleider, 113 Rock St., Newark, N. J.

AGENTS—If you don't make \$1 profit the first day selling Tate's Best Absorbent Dust Cloths, etc., return Samples. Many Agents made \$25. Write quick for particular. Dept. B-4, Consumer's Direct Supply Co., Boston, Mass.

AGENTS Wanted.—Merchandise and shopmen make over \$100 a month in spare time selling transparent handled novelty knives and razors. Big profits. Sales easily made. Write for terms today. Novelty Cutlery Co., 67 Bar St., Canton, O.

500% PROFIT selling our wonderful sign letters for office windows, store fronts and glass signs; resembles finest gold leaf; easily applied; samples free. Metallic Letter Co., 404 N. Clark St., Chicago.

\$1 A WEEK will start you in a big money-making mail order business—with the best line—in spare time. Particulars free. Ambropic Mfg. Co., 1804 Barry Ave., Chicago.

AGENTS—It costs me about \$2.00 to secure your name and ship sample machine, but it's a dead sure way of convincing you I've got best household invention on earth. Contractors and crew managers make up to \$20.00 a day. Elmer E. Stevens, 1109 Adams Express Bldg., Chicago.

AGENTS make big money selling our new gold letters for office windows, store fronts and glass signs. Ans. we can not tell them all. Write today for free sample and full particulars. Metallic Sign Letter Co., 408 N. Clark St., Chicago.

AGENTS Wanted—Sell Rich Looking Imported Silks rugs, \$1 each. R. H. Carter, Milan, Tenn., sold 115 in four days; his profit, \$51. You can do as well. Write for sample offer and unique selling plan; exclusive territory. A. Condon, Rug Importer, Bennington, Maine.

AGENTS make \$20.00 weekly selling our Handy Household Articles; catalogue free. Schaff Co., 121 Wells St., Chicago.

SALESMEN wanted: A reliable, permanent business, selling Koeth's Combination Kit. The most wonderful tool ever invented. Six pairs drop forged tool steel jaws, one pair handles makes pliers, punches, punches, wrenches, etc. Invaluable for mechanic, farmer, chauffeur, handy man. Custer-Koeth Mfg. Co., 52 West Street, Cuddeback, Pa.

We pay the largest commissions, make instant delivery. Guaranteed boilers, wear-ware signs and silk knit neckties, free sample plan. Credit allowed. The Direct Company, 11 South St., Boston, Mass.

"ALTA," the famous \$6.00 Vacuum Cleaner, seeks a few more willing agents to show its merits and possible prosperity and success in return. Write for all-edge proposition. Alex. Co., 363 W. 5th St., Dept. H, New York.

AGENTS—Our Columbia Folding Hand Bag is the best proposition on the market. Not sold in stores. Big profit. Write for terms and other big sellers. S. V. Diamond, 35 West 21st St., N. Y. C.

MEDALLIONS sell at sight, 200 per cent in 100 per cent profit. Make up your own goods and be independent. "It's easy." Catalog free. Fred Isaac Co., 1915 W. Randolph St., Chicago.

WE manufacture six fascinating game boards, 100% profit. Orders repeat. Can be carried as side line where Candy, Pictures and Cigars are sold. Particulars free. Unique Novelty Co., Independence, Mo.

HOSIERY. Agents make 25% commission selling our Guaranteed Hosiery direct to consumers. Write us. Manufacturer, Box 238, Mahanoy, Penna.

WANTED—Active man by every means. To join this Society. Carry its sick, accident, death Benefits. Get friends to join. Start time, 150 to \$150 a month. Write, Box BX-293, Burlington, Ky.

AGENTS—Unusual sellers. Big profit partners. Novelty jewelry, perfume, cosmetics. Price list, particularly free. Black Bros., 477 Eighth Avenue, New York.

PERFECTION Pocket Adding Machine, Lightning seller. Agents wanted. Cincinnati Specialty Mfg. Co., Dept. B, Cincinnati, Ohio.

AGENTS—\$3 daily selling our Handy Tool, 13 articles in one. Lightning seller. Sample free. Thomas Mfg. Company, 462 Third St., Dayton, Ohio.

\$100 MONTHLY and expenses to trustworthy men and women to travel and distribute samples; big manufacturer. Standard Work, S. Scherer, Texas, G. W., Chicago.

STOP here! Let me start you in a home business that will bring you money every day. Experience unnecessary. Spare time. No advertising. I furnish everything and guarantee success. Send for gratis. Yoshihiko, Dept. C. II., Omaha, Neb.

SALESMAN. Sell the best 47.50 Hand Vacuum Cleaner Made. Our Cleaner and Commissions beat them all. Address, Executive Mfg. Co., Indianapolis, Ind.

400% PROFIT selling Gordon Photo Filter Tap. High grade work. Samples and catalogue free. Luther Gordon Co., Northwestern Bldg., Chicago.

WE manufacture four fascinating game boards; 100% profit; orders repeat; best slide line with cards, candy, etc. Particulars. Bechtler Game Co., Independence, Iowa.

I WILL start you earning \$1 daily at home in spare time, altering mirrors; no capital; send for free instructions booklet, giving plans of operations. G. F. Redmond, Dept. 308, Boston, Mass.

SEE what we say under "Patents." Swift, Attorney, Washington, D. C.

STUN letter cases—Painters: Something new and better: Attractive Gold or Silver Letters, 21 different kinds. Anyone can apply them. Make big money lettering signs windows and selling our sparkling, flashing chipped glass nameplates and signs. 1912 catalogue and sample letter free. Attractive Signs Co., 2525 North Clark St., Chicago.

KEY big—German silver—marked with your name and address, with key ring, 12 cents. We want you to take orders, 100% profit. We sell blank keys, steel letters, key rings, etc. Please, Dio Maker, Winchester, N. H.

WANTED—One agent to sell "The American Lady Fibre Broom" on 1 year's guarantee. Does away with corn brooms. Exclusive territory; free samples; big permanent business; 1 man in every county. E. L. Hunt, 2225 S. State St., Chicago.

AGENTS make enormous profit handling our quick-selling imported Oriental slippers and stockings. Never been advertised. No orders. Exclusive territory. Show Kinemac, Box 528, Portland, Oregon.

CEMENT

If you want the best information on cement and concrete construction, subscribe for Concrete-Cement Age, leading cement and concrete monthly. Sample copy, 10 cents. Yearly subscription, \$1.50. Concrete-Cement Age, 125 Newberry Ridge, Detroit, Mich.

CONCRETE Building Block Machines and moulds. Free catalogue. S. Market St., St. Louis, Mo.

DUPPLICATORS AND DEVICES

MATALANE duplicators—Our note size 4x6 only \$1. Ask circular. Matalane, 1229 Southern Boulevard, New York.

HOW to get a Heliograph that will make 150 copies in 10 minutes; letter size, \$2.50. Write for circular. Meyer Duplicator Co., 118 No. LaSalle St., Chicago.

TO MANUFACTURERS

MANUFACTURERS. Wanted sale Agents for the Island of Cuba. Bank references. H. Price-Williams, Marietta, Ohio.

MUSIC

LEARN Piano instantly with or without instruction or teacher—by note, waltz song, harmonies, etc. World's greatest and easiest, never before possible. Particulars free. Inland Music House, Chicago, Ill.

SONG writers, send us your poems for our special 1912 publishing offer. Box 1207, New Orleans, La.

PIANOS Wanted. Highest compensation. Send to Inland Music House, Chicago.

MELODEONS written to song poems. Will correct all your mistakes. Four dollars. Write, Paragon Publishing Co., Metuchen, N. J.

CASH for names and addresses of piano players. Cinderella; latest musical hit; and plan, 15 cents. W. Mills, Gifford, Ark.

IF you want the fastest sheet music and a better assortment for less money than elsewhere, write for our catalog. Remond's Music House, 304 West Ave., Norwalk, Connecticut.

ANY Popular Sheet Music you want. No matter where published, we will send postpaid for 15c per copy. Willis Woodard & Co., 1187 Broadway, New York.

TAO-TIME piano playing taught by mail. Book free. Christensen, 84 Auditorium Bldg., Chicago.

ALL the favorite old songs. Words and music complete in book form with attractive cover; size 7½x10½ inches; good value. Price 25 cents, postpaid. Popular Mechanics Book Dept., Chicago.

POPULAR MECHANICS ADVERTISING SECTION

19

HELP WANTED

SALESAGEN—Agents sell Handy Telephone Index in your store home. There's an advertising novelty that every merchant will order. Used in home or office; appreciated by all. The cost is a trifle. Index with "old" lists for years. Standard mouthpiece of all phones. Adapted to furnish address of advertiser. Big money in this. Particulars free. Sample 10c. Heldensbach & Co., Dept. 21-A, 209 S. State St., Chicago.

HABIT \$10 to \$15 a week and build your position besides. No commission. We, as manufacturers of patented just-in-season specialties, have new easy mail order lists to keep factories busy. We furnish everything. Large profits. Small capital. Experience unnecessary. If you are one of the want-to-go-around kind, write for our most modern (copyrighted) plans. Secure statement. J. M. Pratt Mfg. Co., 545 Prairie St., Michigan St., Buffalo, N. Y.

BIG MONEY WRITING SONGS. Hundreds of dollars have been made by others of successful words or music. Past experience unnecessary. Send us your song poems, with or without music, or write for free particulars. Acceptance guaranteed if available. Washington only place to secure copyright. H. Kirkus Dugdale Co., Dept. 202, Washington, D. C.

SELS Wanted for messengers and brakemen on all railroads; \$80 to \$100 monthly; promotion, engine-conductor; experience unnecessary; no strike; age 18-35. Headquartered employing headquarters; thousands of men sent to positions on over 1,000 official calls. State age. Address Railway Association, Dept. B, 227 Monroe Street, Brooklyn, N. Y.

WE teach you a trade in a few months' time; no expense but time work, regular, automobile, plumbing, bricklaying, 100 satisfied students today; forty jobs going. Catalogue free. United Trade School Contracting Co., Los Angeles.

TWO energetic, clean-cut salesmen, one, stores and plants. The Biggest Oil Company, Cleveland, O.

ANYWHERE, handymen can make big money with our gold winner plan letters best on earth. Slim-Slim System, 1519 Alameda St., Detroit, Mich.

WANTED—In every town reliable man to distribute circulars, samples, papers, tank signs, etc. Good pay; no advertising. Machine Stamp. Charles L. Sims, Bronx, N. Y.

WANTED—Tool designer, man with experience in designing and machinery. Apply to Employment, Box 311, Pittsburgh, Pa.

\$15 PER week to start appearing energetic showman for a hundredth full article. Ladies or gentlemen. No triflers. Department 24, The National Vacuum Machinery Co., Dayton, Ohio.

WANTED—Acme Automatic Screw Machine Works, Gridley Automatic Screw Machine Works, Tool Stakers and Contractors, Address P. O. Box 611, Pittsburg, Pa.

WANTED—Men and women; for green-jacketed positions, \$300 monthly. August term. Short hours. No "holidays." Common education sufficient. Over 12,000 appointments coming. Job hunting unnecessary. Farmers eligible. Send postal immediately for free list of positions open. Franklin Institute, Dept. D 21, Rochester, N. Y.

SALESMAN—For our Franklin Accident and Health Policies. Premiums \$5 and \$10 a year. Exceptional opportunity for business to establish themselves in a permanent business. Write now. Dept. K, National Life Insurance Company of U. S. A., 22 So. La Salle Street, Chicago.

F. S. Government wants Railway Mail Clerks—City Carriers—Postoffice Clerks. \$60 month. Short hours. Steady work. Examinations everywhere soon. Coaching free. Write immediately. Franklin Institute, Dept. D 21, Rochester, N. Y.

AGENTS make big money and become sales managers for our goods. Past office sellers. Fine profits. Particulars and sample free. One Up Pen Company, Dept. G, Baltimore, Md.

U. S. Government wants Railway Mail Clerks—City Carriers—Postoffice Clerks. \$60 month. Short hours. Steady work. Examinations everywhere soon. Coaching free. Write immediately. Franklin Institute, Dept. D 21, Rochester, N. Y.

YOU'll be paid up to \$100 good monthly commissions only \$1.75. Write me before placing any advertisement. I'll send you money. F. L. Miller, Scranton, Pa.

MEN and women wanted for Government jobs. \$80 month. Write for list of positions open. Franklin Institute, Dept. D 21, Rochester, N. Y.

YOUNG men, would you accept and wear a fine tailor-made suit just for showing it to your friends? Then write Blanket Tailoring Company, Dept. 610, Chicago, and get beautiful samples, styles and a wonderful offer. We pay the express too.

7,000 GOVERNMENT jobs open. Write for list. Franklin Institute, Dept. D 21, Rochester, N. Y.

BIG MONEY WRITING SONGS. Hundreds of dollars have been made by writers of successful words or music. Past experience unnecessary. Send us your songs, with or without music, or write for free particulars. Acceptance guaranteed if available. Washington only place to secure copyright. H. Kirkus Dugdale Co., Dept. 202, Washington, D. C.

GOVERNMENT wants employees. Write for list of positions open. Franklin Institute, Dept. D 21, Rochester, N. Y.

WANTED—Railway Mail Clerk—City Carrier. \$600 month. Examinations everywhere soon. Coaching free. Franklin Institute, Dept. D 21, Rochester, N. Y.

WANTED—Distributors of advertising stationery everywhere. American Distribution, Inc., Mount Pleasant, Pennsylvania.

WANTED one thousand chauffeurs and regular men. Our demand for automobile engineers exceeds the supply. Write for men of intelligence and mechanics. Least capable at commanding \$100.00 to \$150.00 per month upon graduation. Resident course \$30.00 to \$60.00. Home Correspondence course completed by practical road and shop work at this school, highly successful. Look this up. Auto Schools of America, Dept. T, 1010 Michigan Ave., Chicago.

STOP here! Let me start you in a business that will bring you money every day. Experience unnecessary. Spare time. No coaching. I furnish everything and guarantee success. Send for pros. Voitline, Dept. C, 31, Omaha, Neb.

I WILL start you earning \$4 daily at home in spare time, directing interests to capital; send for free instruction booklet giving plans of operation. G. V. Redmond, Dept. 308, Boston, Mass.

BE an electrical meterman—\$100 to \$1,000 a year. New field. Demand for competent metermen greater than supply. Personal, technical, mill instruction available for you for intended position. Correspondence solicited. Write for particulars. Fort Wayne Correspondence Schools, Dept. 20, Fort Wayne, Ind.

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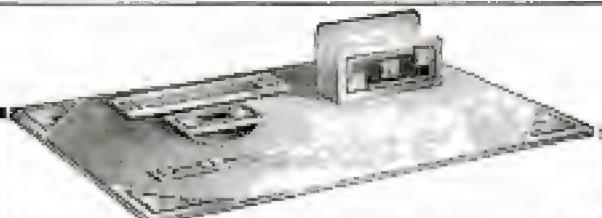
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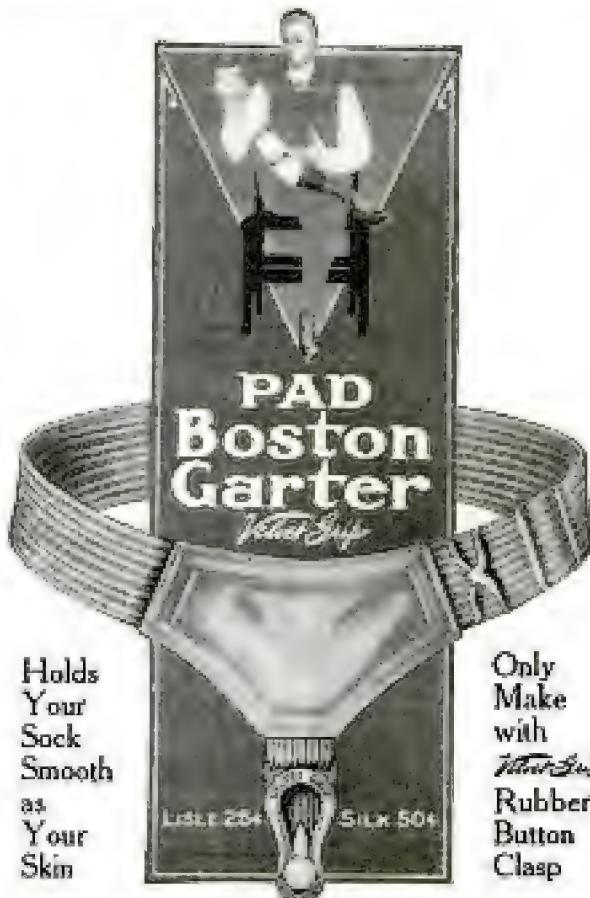
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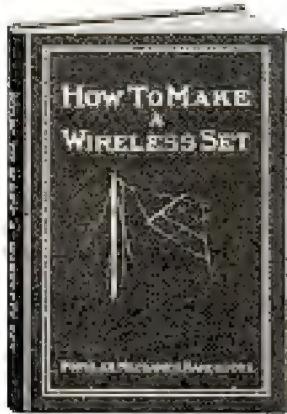
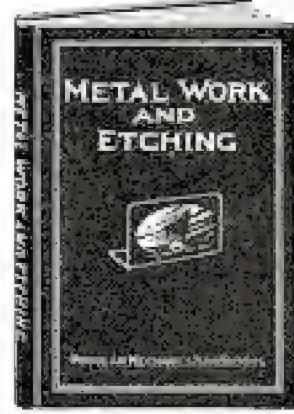
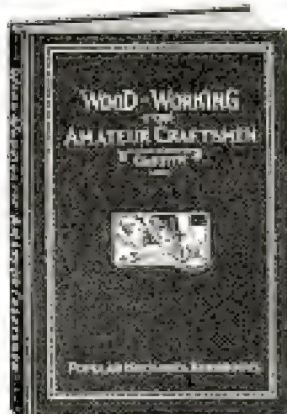
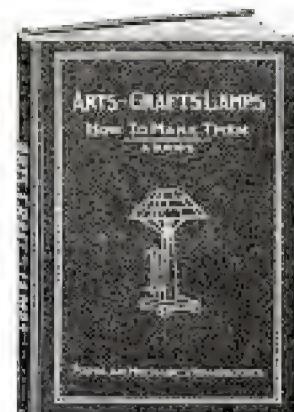
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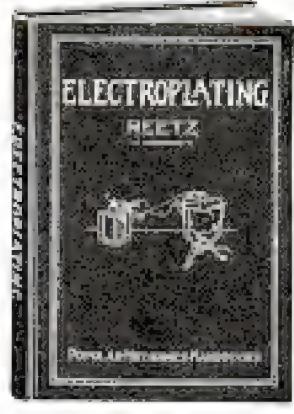
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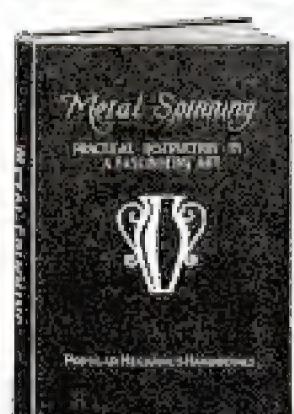
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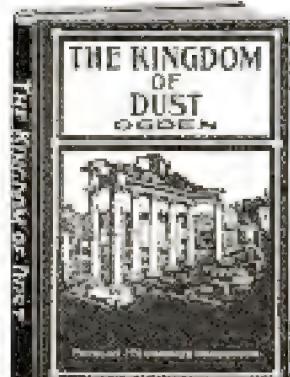
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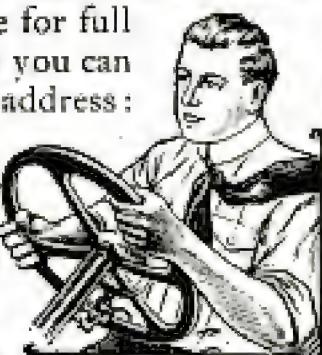
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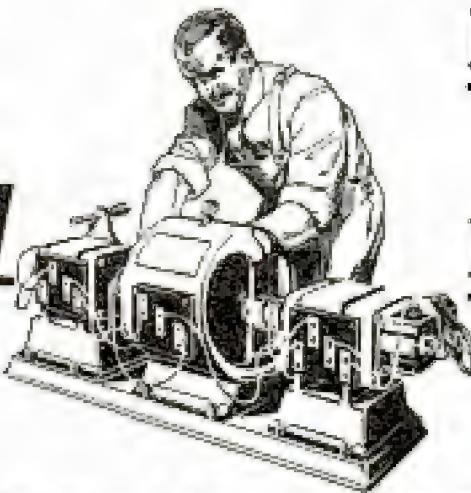
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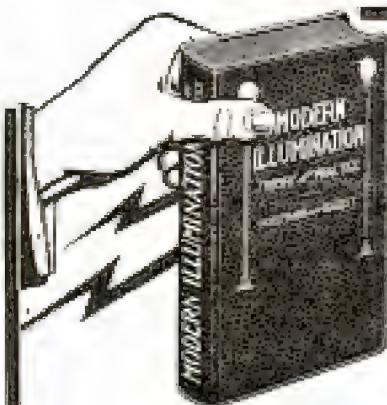
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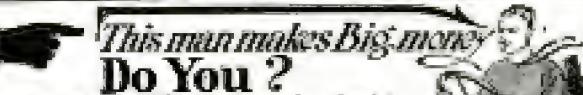
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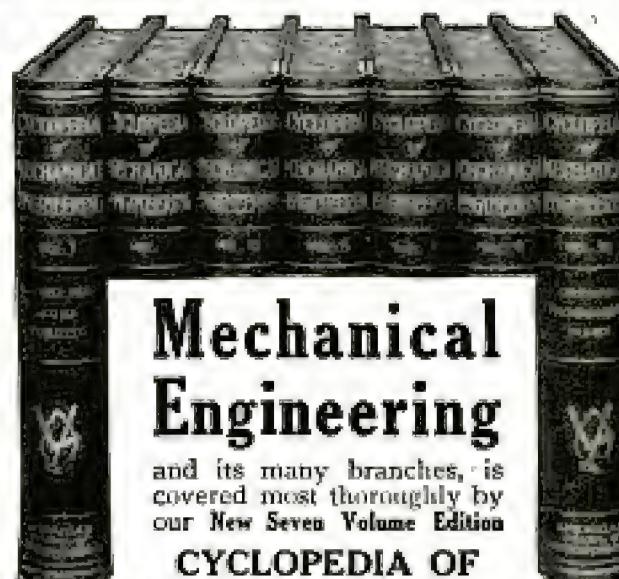
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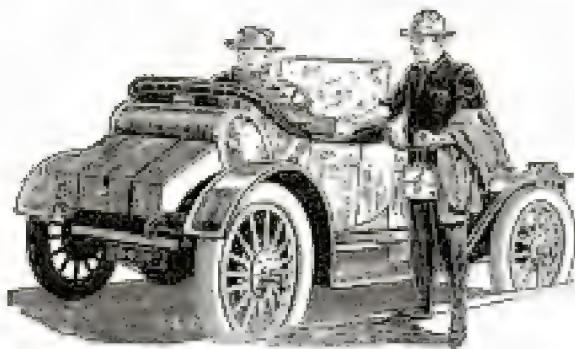
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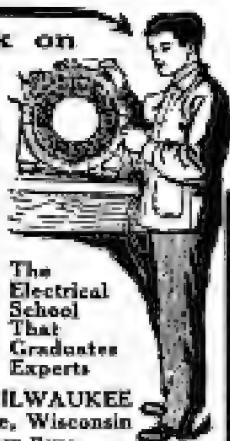
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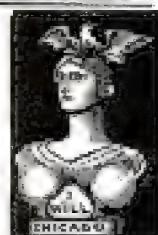
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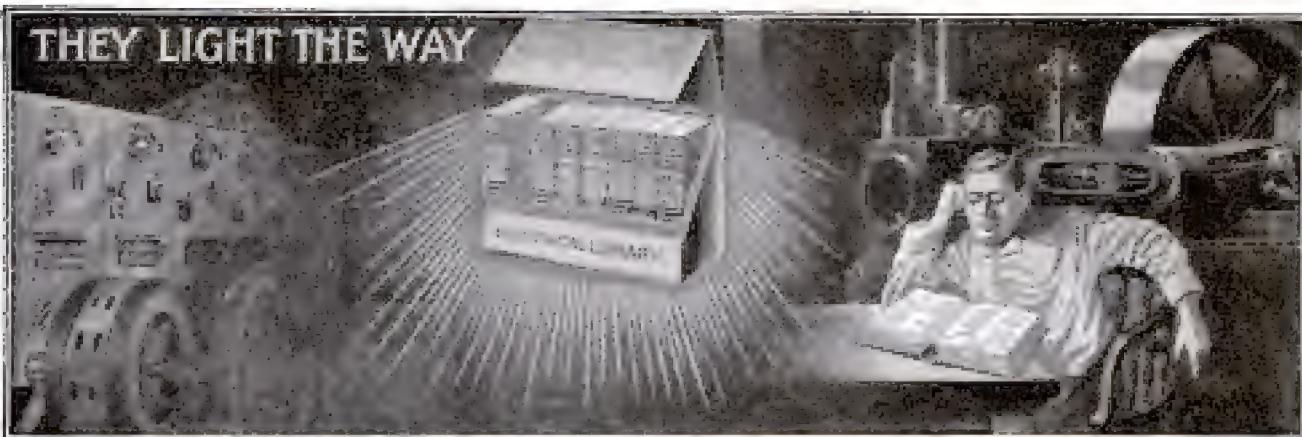
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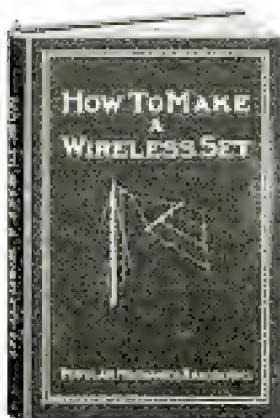
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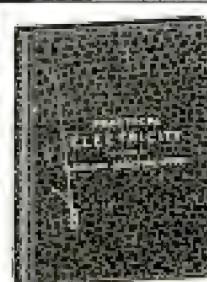
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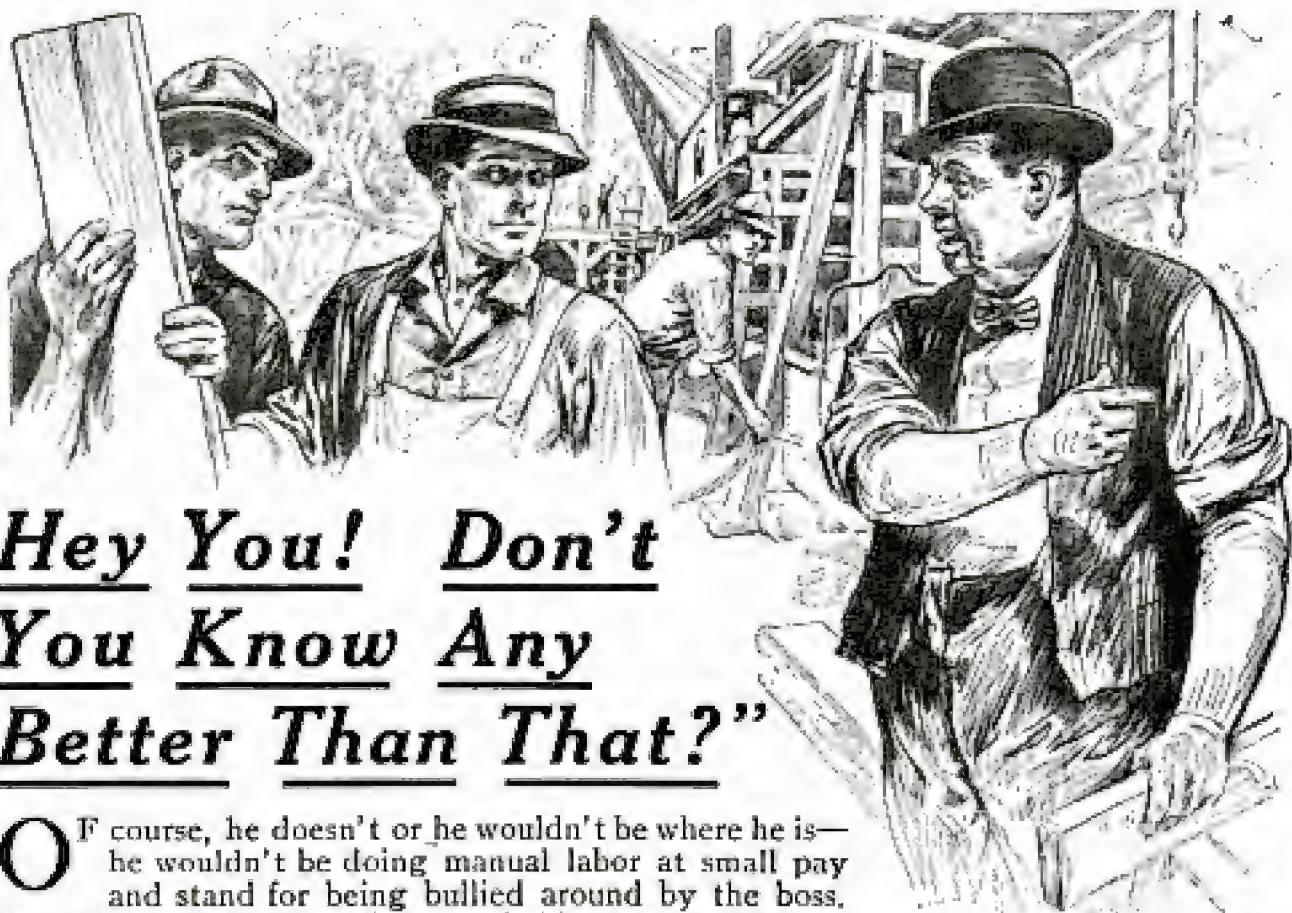


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Lake Michigan as Highway for House-Moving



Large Two-Story House Moved on Scows Three Miles along the Shore of Lake Michigan

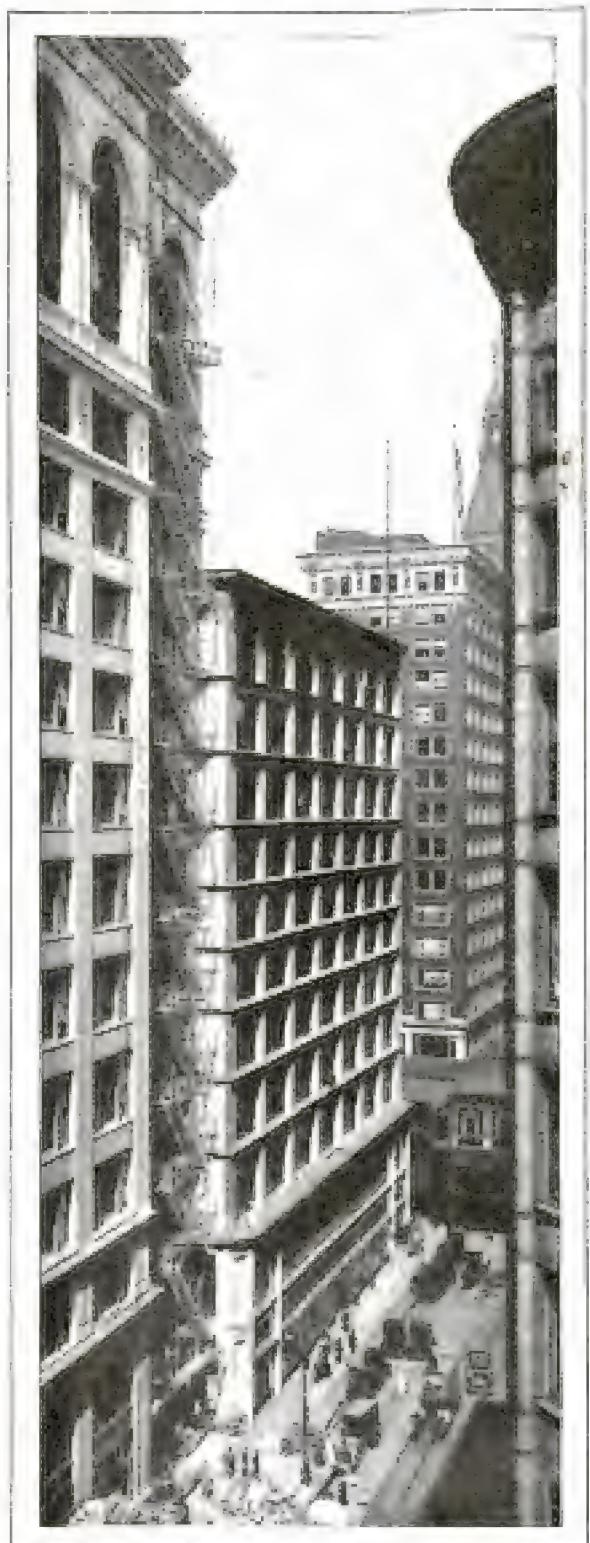
LAKE Michigan has proved, in one instance at least, an economical highway for house moving. The owner of a house and lot at Fifty-fourth Street and Lake Avenue, Chicago, and a lot at Lake Avenue and Seventy-seventh Street, desired to move the house to the latter, some three miles distant, but found that the moving operation, on land, would cost much more than the structure was worth. Then, convinced that he had a white elephant on his hands, he confided his troubles to a friend, who sarcastically remarked that he had better

use it as a private yacht, and this gave him the idea of moving the house by water. Subsequently, the house, which is a large two-story structure, was moved over a pontoon bridge, made necessary by the shallowness of the water along the shore, and rolled onto two scows, which were towed three miles to the new location.

It took about three days of work to get the house onto and off the scows, although the lake trip was accomplished in a little less than an hour. The cost of the operation was less than \$1,000.

CHICAGO SKYSCRAPER HAS RECESSED FIRE ESCAPE

A seemingly practical and rather artistic solution of the fire-escape prob-



Recessed Fire Escape on the Face of Skyscraper Building; an Architectural Idea Which Eliminates Much of the Ugliness of Such Escapes

lem on skyscrapers has been developed in the erection of a new department-store building in Chicago. A fire escape of skeleton construction clinging to the flat face of a tall building is extremely ugly from an artistic viewpoint under any condition, but this ugliness has in this instance been minimized by recessing the wall of the building where the fire escape is located. As a result the fire escape does not project over the sidewalk.

NEW WIRELESS CALLS FOR AMERICAN VESSELS

New wireless call letters, conforming to international radio-telegraphic regulations, have been issued for American merchant vessels and yachts by the Bureau of Navigation of the United States Department of Commerce and Labor, and are now effective.

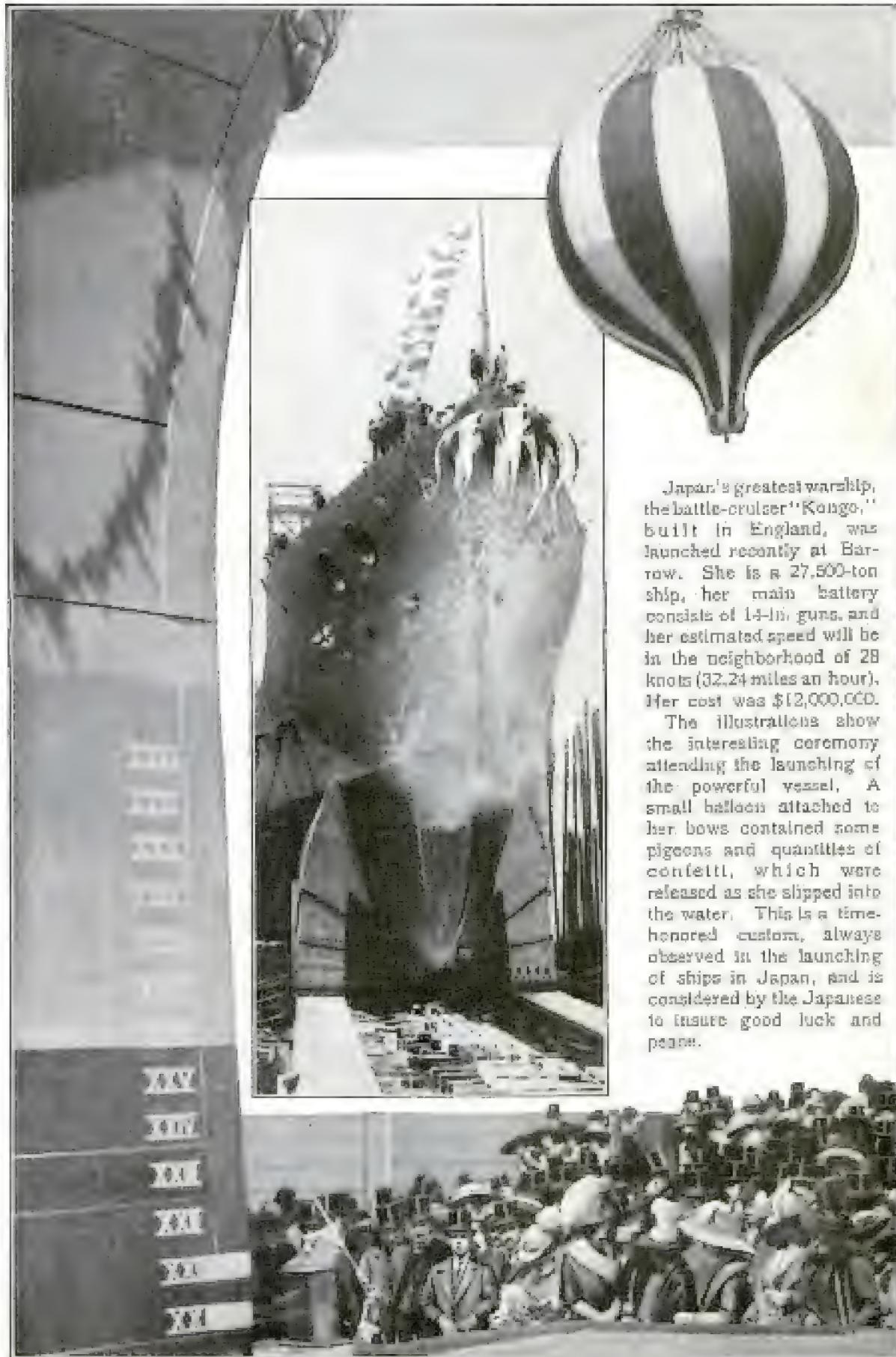
In view of the recent ratification by the Senate of the Berlin convention, the Berne bureau has consented to assign calls to American ships in advance of the London radio-telegraphic conference.

The system now adopted gives a series of three letters for each call. The letter K, as the first, is assigned to American vessels on the Atlantic Coast, and W, to vessels on the Pacific. R remains the first letter in all calls for American revenue cutters, and N, for vessels of the United States Navy. The list of shore stations with their calls has not been completed.

The letter Y, as the second letter in a group, is reserved for yachts. Hence, for instance, J. Pierpont Morgan's yacht, the "Corsair," has the call KYC, K indicating an American vessel on the Atlantic Coast; Y, a yacht, and C, the "Corsair."

Books for the blind printed in Esperanto with raised letters are in large demand in Europe.

LAUNCHING JAPAN'S GREATEST BATTLESHIP



Japan's greatest warship, the battle-cruiser "Kongo," built in England, was launched recently at Barrow. She is a 27,500-ton ship, her main battery consists of 14-in. guns, and her estimated speed will be in the neighborhood of 28 knots (32.24 miles an hour). Her cost was \$12,000,000.

The illustrations show the interesting ceremony attending the launching of the powerful vessel. A small balloon attached to her bows contained some pigeons and quantities of confetti, which were released as she slipped into the water. This is a time-honored custom, always observed in the launching of ships in Japan, and is considered by the Japanese to insure good luck and peace.

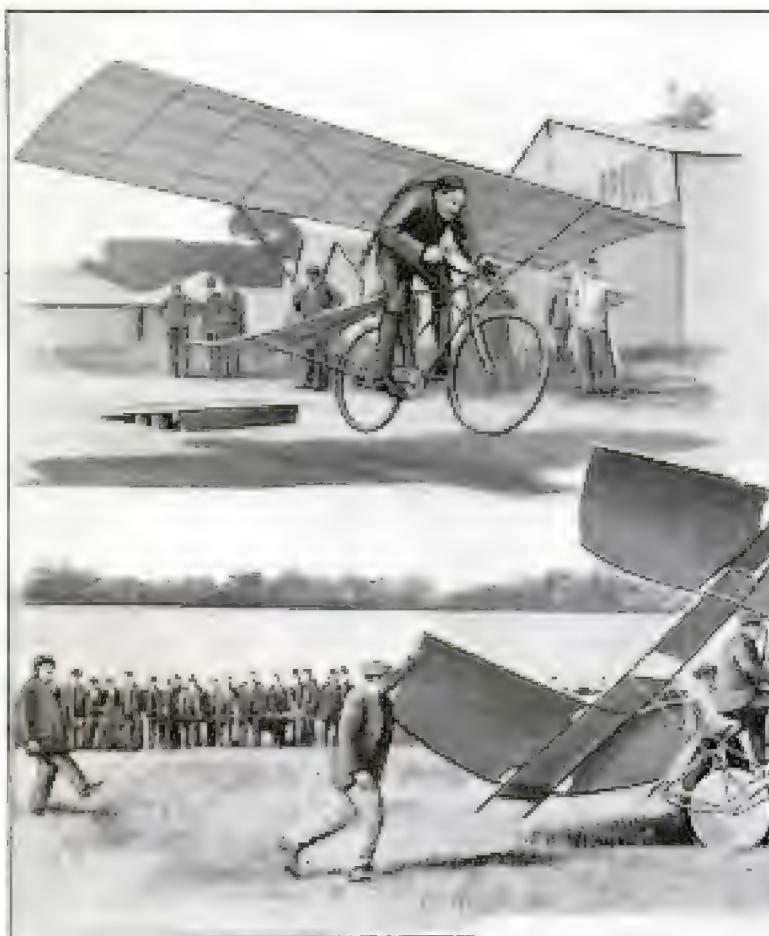
MOTORLESS MAN-FLIGHT TESTS IN FRANCE

The first of two interesting French aviation competitions, involving a prize of \$2,000 for the first accomplishment

garded it from a jumping rather than a flight standpoint, with the result that the machines entered, aptly dubbed

"Aviettes," by the French sporting writers, were ordinary safety bicycles provided with sustaining and controlling surfaces, whereby it was hoped that after a hard run on the ground a sudden tilting of the machine would cause it to leap through the air to at least the specified distance.

That complete failure



The Upper Illustration Shows One of the Unsuccessful "Aviettes" Leaving a Jump-Qif. In the Other may be Seen One of the Machines Rearing Like a Fiery Steed, the Rear Wheel Refusing to Leave the Ground.

of flight by human energy alone, without a motor, has proved a distinct disappointment to the many enthusiasts who expected that its comparatively easy terms would have been readily met. The prize was for a flight of 10 meters (32.8 feet), which distance was selected by the donors on the theory that it just sufficiently exceeded the world's-record distance for a running broad jump, to demand a real flight to accomplish it. Practically all of the competitors, however, seem to have re-



M. Moulin's "Flying Bicycle" in an Ineffectual Attempt to Leave the Ground. The Planes of This Machine are Mounted Exceptionally Low. No Amount of "Knee-Grease," would Raise the Machine into the Air.

resulted for all of the contestants seems definitely to have been due to the most crude and ignorant construction. For, though most aviation engineers are probably skeptical as to the prospect

of sustained man-flight, the simple conditions of the Peugeot prize should have been easily met, while, according to a few experts of high standing, it is freely prophesied that, with the fullest application of present engineering knowledge, and with suitable refinement of design, the prize of \$20,000 offered for the first flight by man power from Paris to Versailles, will be won before many months are past.

In any case, it is certain that the road to success in this interesting field of aerial endeavor must lie in scientific reduction of the forward resistances, rather than in any hope that by main force alone powerful athletes can force present types of structures through the air at sufficiently great speeds to cause them to lift.

The planes of some of the machines, according to a French writer, had an angle of incidence of 20 deg., other machines had tractive propellers 2.3 ft. in diameter, revolving something over a foot in front of the operator, and most of the planes were flat, all of which, in his judgment, is sufficient to prove that the competition could have no real interest, or any bearing on the solution of the problem. He still be-



One of the Motorless Aeroplanes Which Failed to Fly the 32 Ft. Necessary to Win the \$2,000 Prize

lieves that the realization of motorless flight simply depends on the proper construction of the machine.

LEAD ROPE AND LEAD WOOL FOR CALKING

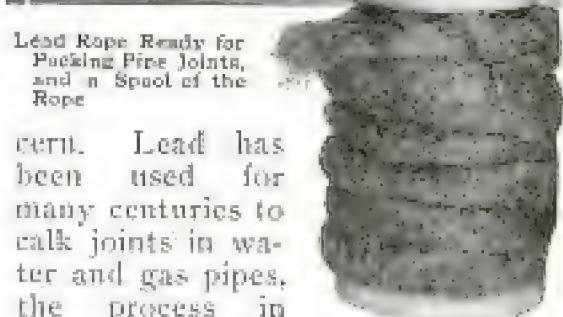
An improvement in the handling of lead for calking and repair work, has of late been made by an eastern con-



Lead Rope Ready for Packing Pipe Joints, and a Spool of the Rope

cern. Lead has been used for many centuries to calk joints in water and gas pipes, the process in vogue being to melt the lead, pour it into the joint, and then calk or hammer the lead to expand it. Calking was necessary because the heated lead, in cooling, contracts, leaving a space between lead and hub, which can only be closed by expanding the lead.

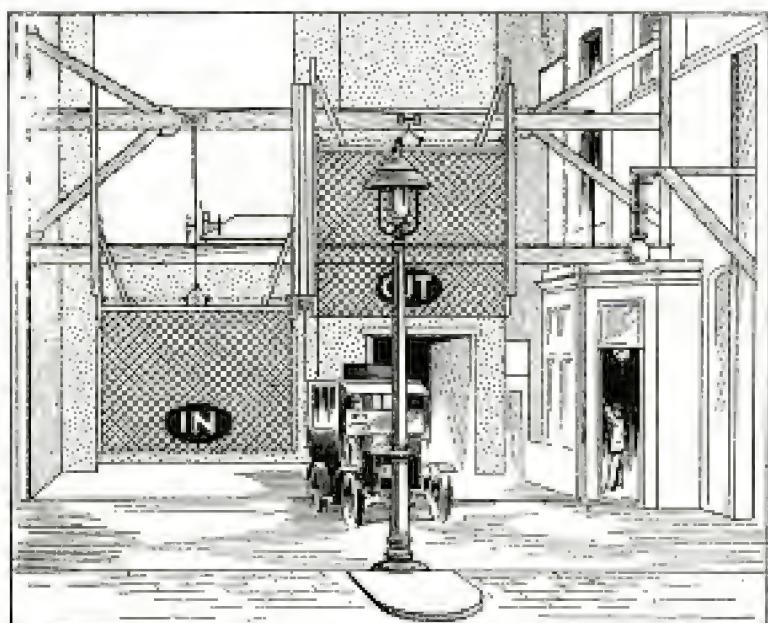
This company has brought out lead wool and lead rope, a spool of which is herewith illustrated. Lead rope is made of specially refined lead, very finely stranded; each strand measuring .007 in, and the rope $\frac{1}{2}$ in. in diameter. When hammered, this rope becomes a very dense mass, and no skill is required to pack it into joints and insure a thoroughly gas or water-proof joint. It is used cold, each length of rope being calked separately, so that the entire space at the joint is filled with lead. The advantages of using lead in this form are that a good joint can be easily made even by an unskilled work-



man; that the danger of injuries from melted lead is eliminated, and that the material is always ready for instant use.

NOVEL DROP GATES FOR GARAGE ENTRANCE

A garage in London, Eng., has a very novel and effective arrangement for preventing rash driving in and out of its building. There are two gates, marked "in" and "out" respectively, which can be raised and lowered, both being normally lowered. Every car wishing to enter or leave the garage



Drop Gates at the Entrance of a London Garage, Designed to Prevent Rash Driving In and Out

is thus compelled to stop until the gate is raised, which enforces careful driving in and out, as well as enabling the timekeeper to check and record the movements of all the cars.

STORING OXYGEN IN AIRMEN BY INJECTION

Injecting pure oxygen gas into the blood of airmen and mountain climbers, as an auxiliary supply to that inhaled into the lungs, is a remarkable means proposed for the prevention of the so-called mountain sickness, which is due to the rarity of air at high

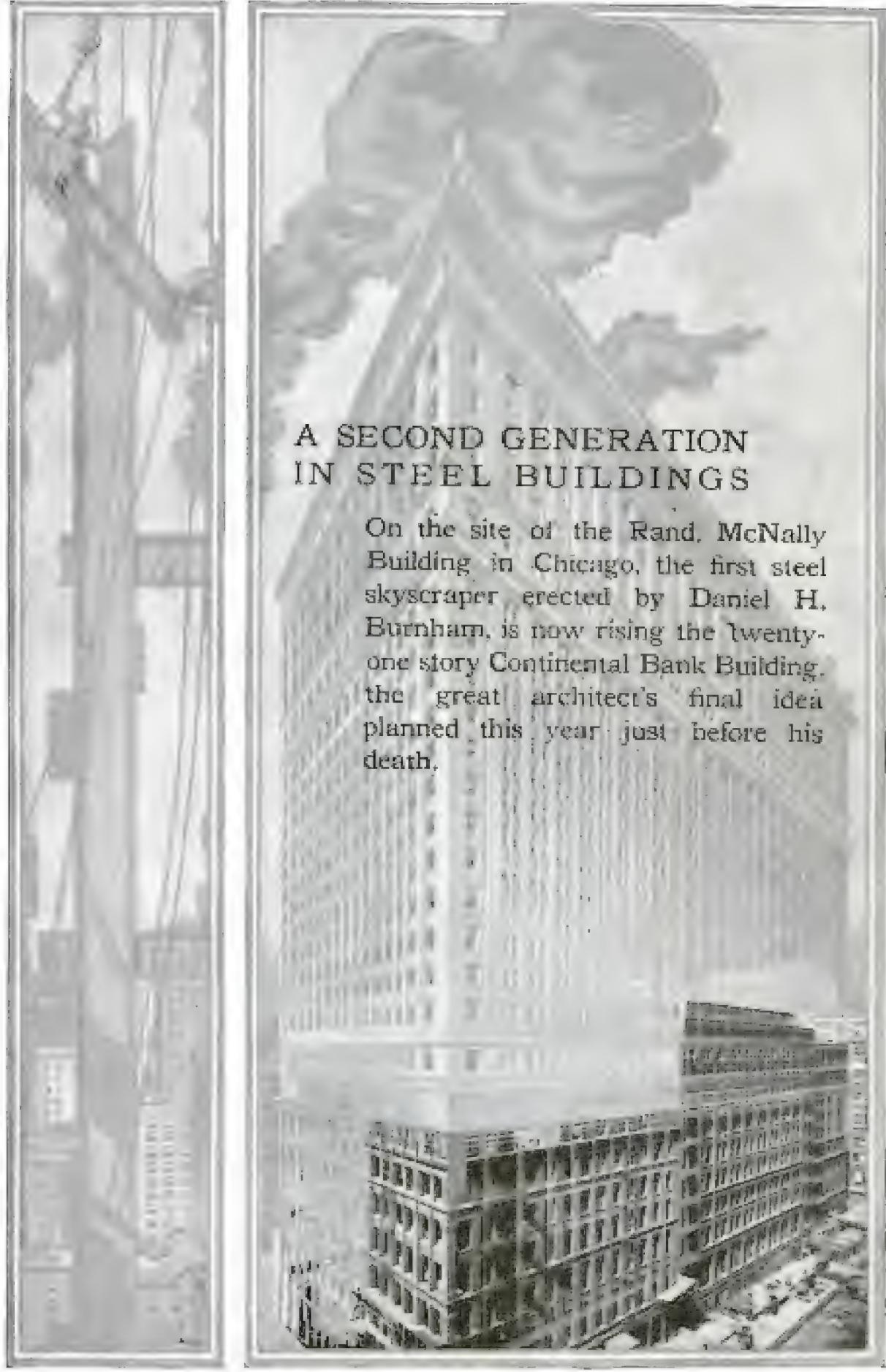
altitudes. The preventive treatment, which was described together with the experiments confirming its efficiency at a recent session of the French Academy of Sciences, consists simply in the subcutaneous injection of small quantities of pure oxygen gas, the effect of which is claimed to persist for several days.

THE EMERGENCY LIGHTING OF THE "MEGANTIC"

The White Star liner "Megantic," a 15,000-ton ship built three years ago for the Montreal-Liverpool route, is provided with an emergency electric-power installation which is much more progressive in its development than that on the ill-fated "Titanic." A 45-hp. Diesel marine engine, direct connected to a dynamo, is installed on one of the upper decks, and connected by separate circuit with the wireless apparatus and with electric lamps fixed in the main passages, saloons and companionways, and also in the neighborhood of the lifeboats. In case of serious disaster a supply of electricity would be available right up to the last moment when the upper

deck sinks below the sea. The apparatus is set to working each day as darkness approaches and continues until daylight, quite irrespective of the fact that the steam-driven electrical dynamos are working. This is done so as to avoid any rush or hurry in starting up the plant in case of anything happening in the night.

CA railroad report cites, as evidence of the need of a practical and infallible automatic stop for trains, figures showing that 171 persons were killed and 931 injured last year because engineers ran past danger signals.



A SECOND GENERATION IN STEEL BUILDINGS

On the site of the Rand McNally Building in Chicago, the first steel skyscraper erected by Daniel H. Burnham, is now rising the twenty-one story Continental Bank Building, the great architect's final idea planned this year just before his death.

Dark Shaded Lower Section Shows Part of Old Building Not Yet Demolished

FEARLESS TESTING OF A DYNAMITE SUBSTITUTE



Safety Demonstration in Which the Inventor of an Explosive More Powerful than Dynamite is Holding a Stick of His Explosive in a Bonfire, While the Spectators Stand Close By.

Shooting Bullets through the New Explosive.



A new substitute for dynamite, so safe to handle that it may be shot full of holes, burned in a fire, or pounded with a hammer without danger, is being introduced into this country by an English mining engineer. And yet its rending power, ounce for ounce, is claimed to be twice that of dynamite, once it is exploded, which is possible only with a percussion cap.

The particular interest of the illus-

tration showing the inventor of the explosive holding the end of it in a bonfire, does not lie, however, in this demonstration of its harmlessness, but in the nonchalant air of the spectators of the test, standing but a few feet away.

AEROPLANE ACTIVITY IN THE ARMY

Despite the accident which caused the deaths of Lieutenant Hazlehurst and Airman Welsh, one of the Wright representatives working with the army airmen, the work of the army aerial corps is steadily progressing. Among the new departures is the installation of hydro-aeroplanes at the College Park, Md., school, where Capt. Paul W. Beck and Lieut. Joseph M. Kennedy will experiment with them.

The officers who have been training at the aviation schools at Augusta, Ga., and College Park are also called upon to put their knowledge of flight to practical use. The aeroplanes will be used, in conjunction with field artillery, to direct from aloft the fire of batteries from which the targets used to represent an enemy cannot be seen.

APPARATUS TO DETECT CHANGES IN FRUIT



Automatic Devices for Controlling Temperatures and Recording Temperature Differences

Through the ingenuity of scientific men in the Office of Experiment Stations of the Department of Agriculture, an apparatus, known as the respiration calorimeter, has recently been invented to aid in the determination of changes which take place in unripe fruit and vegetables after they have been picked and transported.

With an apparent greed to obtain high prices for their products in the earliest season, orchardists and truck farmers send to remote markets various kinds of unmatured fruits and vegetables. Necessarily the most scientific methods must be followed in the storing and shipping of these products to provide against great losses.

The respiration calorimeter is quite similar to the larger calorimeter which has been in use for some time, and which was designed for the study of problems as to the relation between the use man makes of his food and his efficiency as a labor producer.

View Showing Interior of Respiration Calorimeter

The great advancement in the methods of storing and transportation which now put the summer fruits and vegetables within the reach of the consumer at all seasons of the year, requires new systems of growing crops, and very different methods in sending the garden and orchard produce great distances than are necessary or profitable for produce designed for near-by markets, where a few miles and

a few hours only intervene between the picking and the final selling.

Such few experiments as have been made in the ripening of fruits by means of the calorimeter have been sufficiently enlightening to warrant an exhaustive and elaborate investigation, with the use of the same apparatus, in order to acquire better knowledge of the fermentations which follow maturity, and to provide against the subsequent losses. Such knowledge would be of the utmost value to all farmers, orchardists and truckers who store and ship fruit and vegetables in large quantities.

While this calorimeter is designed especially for the study of fruit and vegetable products, it has been so constructed that the respiration chamber can be removed and another substituted for it. This would not involve any change in the recording and controlling devices, nor in other accessory apparatus. It would be possible, with minor changes, to adapt this apparatus to the study of other problems, such as, for instance, the incubation of eggs and the changes which take place in curing and storing meats and cheese.

The inner or respiration chamber proper of the calorimeter consists of a double-walled, air and heat-tight copper box, 18 in. by 18 in. by 36 in., and

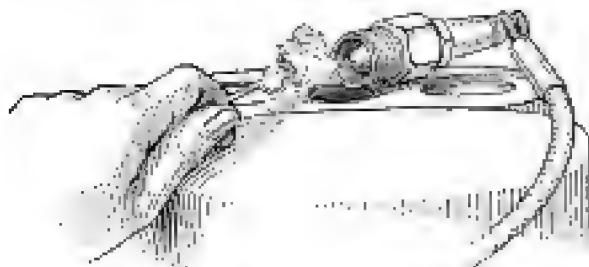
will accommodate one bunch of bananas or a similar quantity of fruit or vegetables, which are packed in the apparatus in the same manner as when shipped to market. Surrounding the respiration chamber and separated from it by an air space is a thick outer covering, which is a poor conductor of heat, and prevents changes of temperature in the surrounding air from affecting the temperature in the chamber.

To make it air-tight the seams in the copper walls are carefully soldered, and when an experiment is in progress all openings into the chamber are hermetically sealed, while air is forced through it constantly. The outgoing air is purified of the products of the respiration, which are carbonic acid and water; and thus there is a continuous circulation and purification of air throughout any experiment. To make the apparatus heat-tight, provision has been made by which the two walls are kept at the same temperature.

Three windows are placed in the box-like affair near the top, two of which are on opposite sides, thus providing a view of the contents of the chamber, which is lighted with a small electric light. The windows are hermetically closed with sealing wax, and may easily be removed when samples are to be examined.

GETTING LIGHT FROM AN AUTOMOBILE

When it happens that a man finds himself without a match or any light-



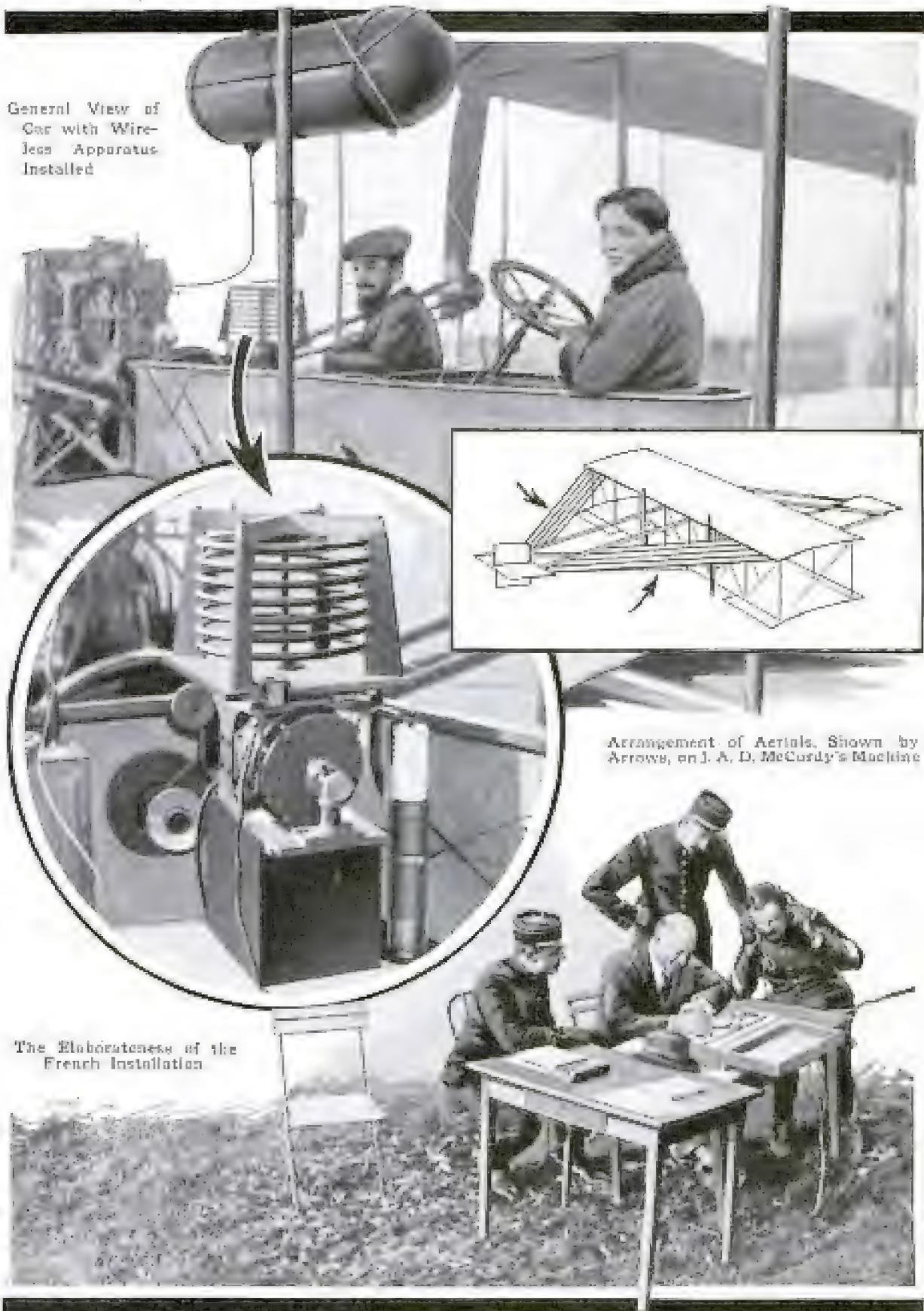
Lack of Matches Need Not Prevent Automobileists from Lighting Lamps

ing device when darkness overtakes him and it is necessary to light the

lamps on the car, there is a solution to the difficulty. Disconnect one of the spark plugs and tie a piece of cotton waste to a stick with a piece of string. Cover this liberally with gasoline and turn the starting handle slowly until the plug sparks.

Sillar, a hard compact clay, is the principal building material in the vicinity of Monterey, Mexico, the clay being cut into blocks, in much the same manner as ice is cut from lakes and rivers in the north, and buildings constructed of these blocks, being later plastered inside and outside. Sillar is cheaper than adobe mud or plaster and consequently more generally used.

NEW WIRELESS INSTALLATIONS FOR AEROPLANES



New wireless installations for aeroplanes, one American, the other French, are shown in the accompanying illustrations; the former, an arrangement of the aerial, is shown in the line drawing, while the three other illustrations show the French installation on a Savyne aeroplane, and officers on the ground in wireless communication with it. The aerials of the American installation are rigged from the tail to the main planes of the machine, which is the idea of Airmen McCurdy.



Causeway, More Than Two Miles Long, Which Now Connects the Island of Galveston, Texas, with the Mainland, and Makes Provision for Pedestrians, Vehicles, and Trains.

FINE-TEXTURE PAPER MADE FROM GRAPEVINES

Grapevines have been found to yield, by a special chemical treatment and the usual process of maceration, a pulp from which an excellent quality of paper can be made.

The experiments leading to the discovery were made at a French school, which is devoted exclusively to the study of paper making, and it is said that paper made from this pulp is very beautiful, has nearly the same strength as parchment, and in many respects resembles Japanese paper. It is further stated that it is particularly adapted for lithographic, chromolithographic, halftone, and other styles of art printing now in general use.

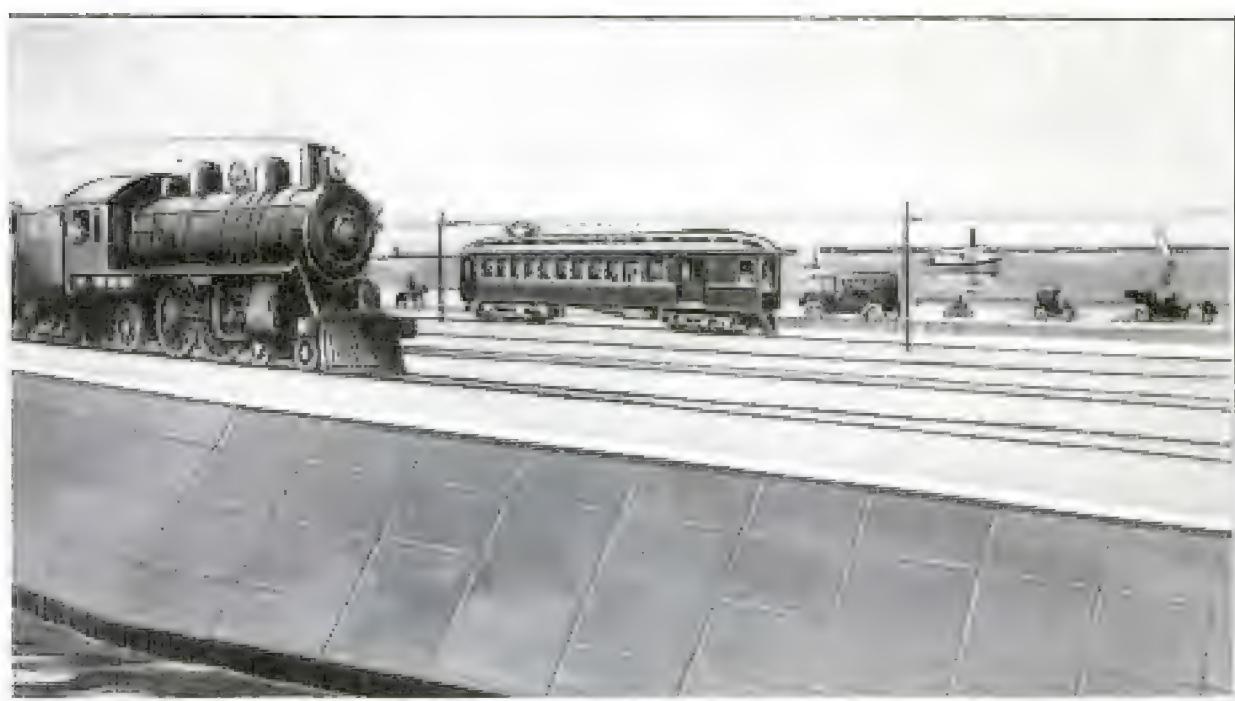
GALVESTON'S GREAT CAUSEWAY OPENED

Galveston's \$2,000,000 causeway, the third of the three great works of protective engineering planned to fortify that city against a repetition of the disaster which destroyed it in 1900, was recently opened to traffic. Governor Colquitt of Texas, at the wheel of an automobile, headed a procession of more than 1,000 cars, driving his machine through a barrier of ribbons and oleander blossoms.

The causeway stretches across Galveston Bay for 12,642 ft. Midway between mainland and island, the passage of ocean liners is permitted by a lift bridge, operated by electric motors, which leaves a clear span of 100 ft.



View of the Surface of the New \$2,000,000 Causeway



Mainland, as an Additional Protection against a Repetition of the Tidal-Wave Disaster of Twelve Years
Traffic, Electric Railways and Steam Railroads

when raised. The causeway proper, which is the filled and protected roadway approaching the arch-bridge portion from both the island and mainland ends, is 1,640 ft. long on the mainland side and 5,500 ft. on the island side. The arch-bridge portion is 2,472 ft. in length and 66 ft. in width, while the causeway proper is 110 ft. wide.

As the causeway is used by pedestrians, vehicle traffic, electric railways and steam railroads, the greatest care has to be exercised in the installation of interlocking and signal systems. Where the highway and the interurban

electric road meet on the bascule bridge there has been installed an interlocking system device with gates, so that when cars are crossing, the highway approaches are automatically closed, and vice versa. The installation of the block-signal system, which is said to be the most complete anywhere in the south, cost \$80,000.

The causeway contains 2,620 tons of reinforced metal, 625 tons of tie rods, 74,000 cu. yd. of concrete, 806,600 cu. yd. of filling, 172,081 lin. ft. of concrete piling, and 246,820 lin. ft. of lumber piling.

Great Lift Bridge in Causeway to Permit
Ocean Liners to Pass Through



MAHARAJAH'S VENTILATOR AN AUTO FEATURE

New features in motor-car construction would hardly be looked for in the remote domain of the Maharajah of Rewah, yet in the accompanying illus-



East Indian Potentate's Device to Ventilate His Car

tration may be seen the electric ventilator fan fitted in the roof of the Maharajah's new 38-hp. car. The fan is arranged to suck air in through the ventilation louvers and propel it into the car, the fan being controlled by a convenient switch. A heavy, basin-shaped glass disk is suspended from the roof a short distance below the fan, so as to form a deflector for distributing the air and overcoming the discomfort of a direct draft from the fan.

AMERICAN AIR DEATH RATE IS THE HIGHEST

Twenty-five per cent of the fatal aeroplane accidents are due to the lack of ability of the pilots of the machines, in the opinion of Major Roche of the French Army Aviation Corps. He classifies the causes of accidents under seven general heads. About one-third of the accidents he finds to have been caused by faulty construction of the machines, which the French critic divides under two heads. Lack of proper rigidity and solidity of construction, he believes, causes collapse of about 20 per cent of the machines that fall, and 13 per cent break because of radical errors of construction. Aerobatic displays in the air claim 6

per cent of the victims, he states; 10 to 12 per cent lose their lives through unfavorable conditions of the atmosphere; lack of presence of mind causes 6 per cent, and 13 per cent are due to improper education of the pilots, while no cause is ascribed for the remaining 5 per cent of fatalities.

The experts of *L'Aéro*, the French aviation daily, find that more fatal accidents occur in the United States than elsewhere, in proportion to the number of licensed airmen. In France, where there are some 600 licensed pilots, there have been 27 fatal accidents, or 4.5 per cent of the total number of pilots have been killed. The table prepared by *L'Aéro* of the four principal countries interested in aviation shows:

Country	Licenses	Deaths	Percentage
France	600	27	4.5
Great Britain	168	6	3.57
Germany	133	13	9.77
United States	70	12	17.44

Fourteen deaths have been added to the list since the figures given by Major Roche and *L'Aéro* were compiled. A woman's name is found for the first time on the American record of victims of aeroplane accidents. Miss Julia Clark was fatally injured at the State Fair Grounds, Springfield, Ill., June 17. Miss Clark attempted to make a circuit of the field where an aviation meet was in progress late in the evening. Her machine caught in a tree and was upset, the young woman pilot being thrown to the ground with such force that she died within a few minutes after the accident.

Lieutenant L. W. Hazlehurst of the U. S. Army Aviation Corps and A. T. Welch, one of the Wright experts, were killed by the fall of a machine they were testing at College Park, Md., June 11. They were endeavoring to make a climbing test with a new aeroplane and the machine collapsed while they were 100 ft. in the air. The necks of both men were broken. Another American, Victor L. Mason, was killed in an accident at Brooklands,

England, May 13, when an English aviator, E. V. Fisher, also met his death. Mr. Mason had gone aloft as a passenger with Mr. Fisher when the machine broke. Ray Wheeler, an amateur of St. Louis, Mo., collided with a telegraph pole while making a flight at Kinloch, Mo., and was killed by the resultant fall. In France there were a number of serious accidents. A machine capsized when only 50 ft. from the ground at Juvisy, June 1, and the airman, Edouard Roby, was instantly killed. On June 9, M. Kimmerling, one of the best known pilots in France, was killed at the Mourmelon field while flying with a passenger, M. Tonnel, who also lost his life. The machine collapsed at a height of 300 ft. Captain Dubois and Lieutenant Albert Peignan were the victims of a collision in midair, June 19. The two officers were flying in opposite directions, making a circuit of the field, at Douai, France. Through some miscalculation their machines collided and both fell, being instantly killed. In Germany, Lieutenant von Schlichting was killed at the Johannisthal aerodrome, by a fall of about 40 ft., May 26, and Herr Buehstaetler and Lieutenant Stille, of the German aviation corps, met their death in an accident at Berlin, June 1.

SUBMERGED PIT FOR COAL STORAGE

An electric power plant in Omaha, Neb., stores its emergency supply of coal in a 6,000-ton submerged pit having several interesting features. The pit is supported by piles driven through quicksand to rock, a reinforced concrete wall was erected as a fire protection, and steel rails are imbedded in the concrete floor of the pit to protect it from the bite of the grab bucket. The coal is stored under water to prevent the possibility of spontaneous combustion.

RODIN'S HEAD OF FRANCE

The head of the bronze statue which rises from the socle, or base, of the Champlain Monument, close beside the main shaft, the gift of France to America, is a wonderful example of modern sculpture. M. Hanotaux, ex-minister and



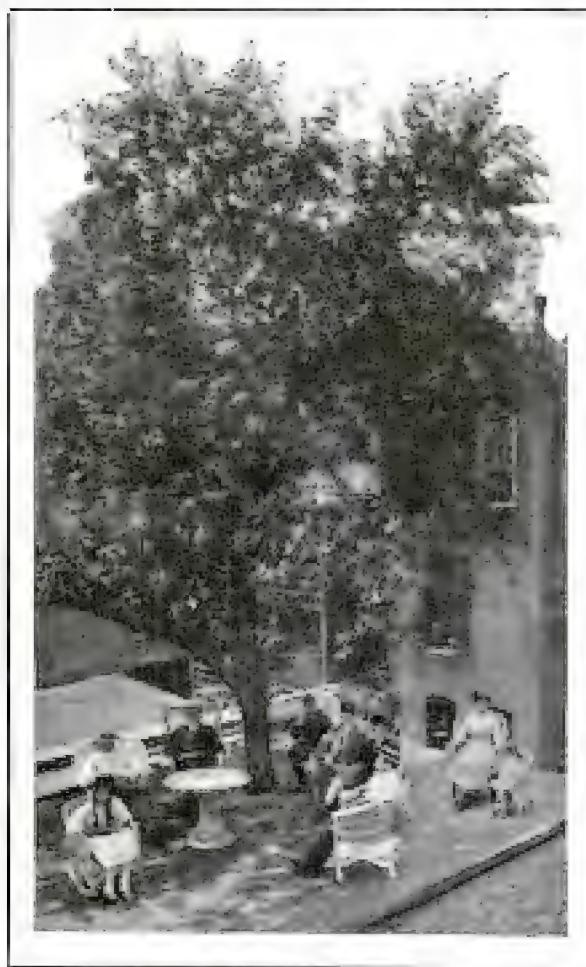
France, as Conceived by the Great Sculptor Rodin for the Champlain Monument

a member of the French presentation committee, said of the statue in his speech at the inauguration of the monument, that "with its face, at the same time smiling and grave; its pure and delicate features; its firm expression, indicating resolve and sincerity, it may well be said to represent a French Minerva."

German theatrical managers, actors and playwrights are taking steps to stop the onslaught of motion pictures, which have practically captured the theatrical business in Germany, even the Kaiser's Imperial Theater having adopted this form of entertainment. The theatrical managers think the pictures should be restricted to educational and scientific subjects.

INTERESTING ROOF-TREE GARDEN

A roof garden, probably unique in Chicago, is shown in the accompanying illustration. In erecting a one-



A Structure with a Very Unusual Roof Tree, Which Provides an Excellent Roof Garden

story flat-topped building in his back yard, the owner did not wish to destroy a large tree, so built the structure around it, and then realized that he had a fine roof garden for the enjoyment of his family and friends.



Wrecked British Submarine, Showing Injuries to Conning Tower

BACTERIA THAT THRIVE ON A DIET OF IRON

Professor S. N. Vinogradskij and H. Molisch have announced, in Berlin, their discovery of a remarkable species of bacteria, which grows only in solutions that contain carbonate of iron.

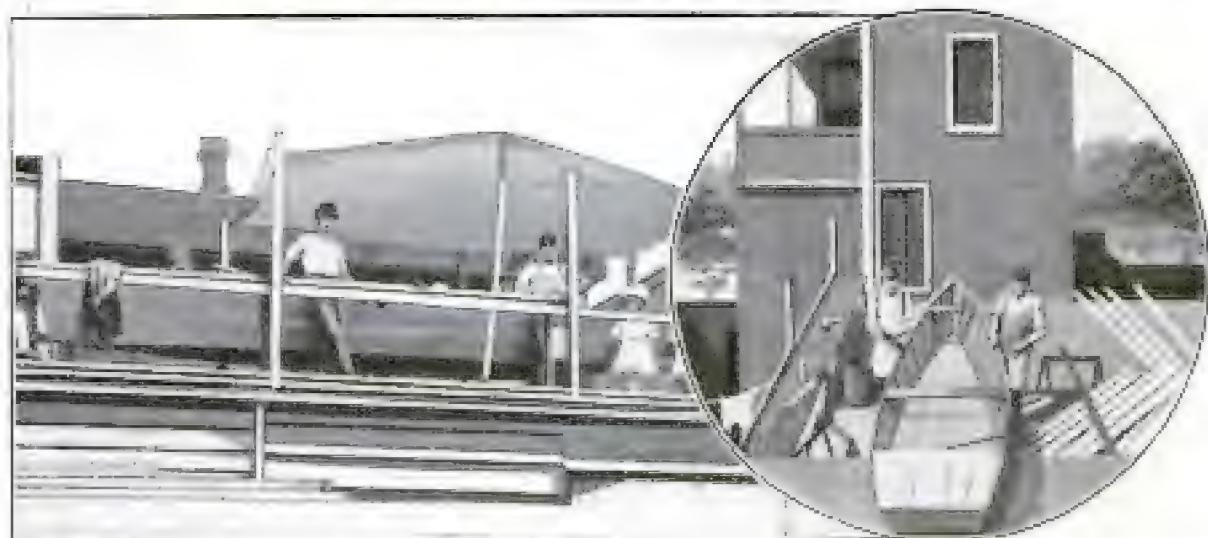
Another striking faculty of these iron germs, is that, in the total absence of other sources of carbon, they are capable of extracting carbon from carbonic acid.

To a germ-nourishing medium, holding inorganic salts in solution, iron filings were added and carbonic-acid gas supplied to the extent of one per cent of the air in the flask. With inorganic salts, metallic iron, and no other source of carbon, there was a great increase in the carbon present in the culture. Great masses of the iron bacteria were formed by growth and multiplication. The microbes, in order to gain one part of carbon, produce from iron carbonate no less than seven hundred parts of oxide of iron.

THE ILL-FATED SUBMARINE "A 3" AFTER RAISING

The accompanying illustration of the British submarine "A 3" shows the little vessel soon after she had been raised. The damage which sent her to the bottom with her entire crew a moment after the collision is clearly shown, the most damage being near the base of the conning tower.





A Motorboat Being Built under an Awning Rigged across the Clothesline Posts on a Roof

The Crew of the Boat Actively at Work Close Beside One of Chicago's Elevated Railways.

BOAT-BUILDING IN UNUSUAL PLACES

Passengers on Chicago elevated railways now and then catch a glimpse of odd shops in queer places, and boat building may be included in the construction activities thus glanced. In the accompanying illustrations is shown a motorboat while being built on a roof at the back of an apartment house. It is a 20-ft. boat which will be provided with a 6-hp. engine. On completion this boat was swung onto a truck in the alley and carted to the Lake Michigan shore for launching.

ELECTRIC REFRIGERATION FOR THE HOME

The conversion of the ordinary box refrigerator into an artificially cooled refrigerator is made possible by the installation of the electric refrigerating and ice-making machine shown mounted on the top of a house refrigerator in the accompanying illustration.

The outfit is about 3 ft. in length, $2\frac{1}{2}$ ft. in height, weighs, complete, 150 lb., and has a 200-lb. capacity. The operating cost is said not to exceed 10 cents per day. It keeps the refrigerator cool all the time; does away with the dirt and slop incident to the use of ice; there are no drip pans or drain pipes to think about, and the interior of the

refrigerator is always clean and sanitary. The moisture in the air inclosed in the refrigerator, or admitted to it upon opening the doors, is precipitated upon the outside of the brine tank in the form of a hard white frost.

The machine is operated by a 1/6-hp. motor, the refrigerator is connected with the water supply of the house, and the ammonia need not be renewed



The Electric Ice-Making and Refrigerating Machine Mounted on the Top of the Ordinary House Refrigerator.

often than once in six months. Any-one can recharge the machine with ammonia by attaching a new filled drum, which is furnished in exchange for the empty drum for the price of the ammonia, which is about 50 cents.

ANCHOR MAST FOR DIRIGIBLES

One of the most ingenious means yet developed for anchoring or mooring dirigible balloons is shown in the accompanying illustration. It is one of the anchor or mooring masts for army dirigibles at Aldershot, England, and is located near the hangar. At the top of the mast is a pivotally mounted cone into which the balloon's nose fits.

RAISING MINK FOR FUR

The raising of wild animals for their fur is a subject of such general interest that the Biological Survey of the Department of Agriculture has been led to conduct experiments in the breeding of mink at the National Zoological Park in Washington. The survey wishes to ascertain whether rearing the animals in captivity can be made commercially



The refrigeration is automatic. A thermostat, set at the degree of temperature desired, controls the electric current, regulating it automatically when the temperature varies from the desired degree of refrigeration.

successful. The experiments seek to supply facts in regard to their housing, feeding, mating, and in general to determine the best methods of caring for the animals. Preliminary hints on mink farming can now be obtained from the Department of Agriculture.

GERMAN ARTIFICIAL SANDSTONE

An artificial sandstone, said to be harder than the natural, and particularly adapted as a material for garden statues, fountains, grave monuments, and other outside sculptures, is being manufactured by a concern in Germany. The new stone is, according to "Die Woche," absolutely weather-resisting as well as considerably harder than natural sandstone, and can be worked in exactly the same manner as the latter. It is made in any desired grain or texture, and can be colored, without the use of foreign coloring substances, into a perfect imitation of the genuine French limestone.

The cost of the artificial sandstone is said to be about half that of the natural.

THE HYDROELECTRIC POWER FROM VICTORIA FALLS

The hydroelectric power company which controls most of the power derived from the Victoria Falls, of the Zambesi River, Rhodesia, Africa, will, by the close of this year, be operating four power stations having an aggregate capacity of 156,000 hp. Additional plants, now in construction by the company, will increase the capacity to 232,000 hp., all of which has already been contracted for.

The available water power at the Victoria Falls is far greater than that of Niagara.

BEARLIKE SHEPHERD DOGS OF THE PYRENEES

It has already been noted by scientists that certain mountain dogs have shapes and assume attributes reminding of a bear's. Among these dogs the sheep dog of the Pyrenees bears a closer resemblance to the bear than most others. Although he is seldom over 20 in. high, his bones are very massive and his muscles exceptionally developed. His fur is thick, consisting of long, fine, silky hair, either black, dun-colored, or gray. His head is large and the nose tapering, the eyes small but sharp and lustrous, his ears always "attentive." The toes and the base of the feet are elongated and flat. The tail is very short, or even entirely missing, and by his manner of



Dog of the Pyrenees Which has Developed Many Bearlike Features

climbing the abrupt mountain slopes in quest of some strayed member of his flock, he may easily be mistaken for a young bear.

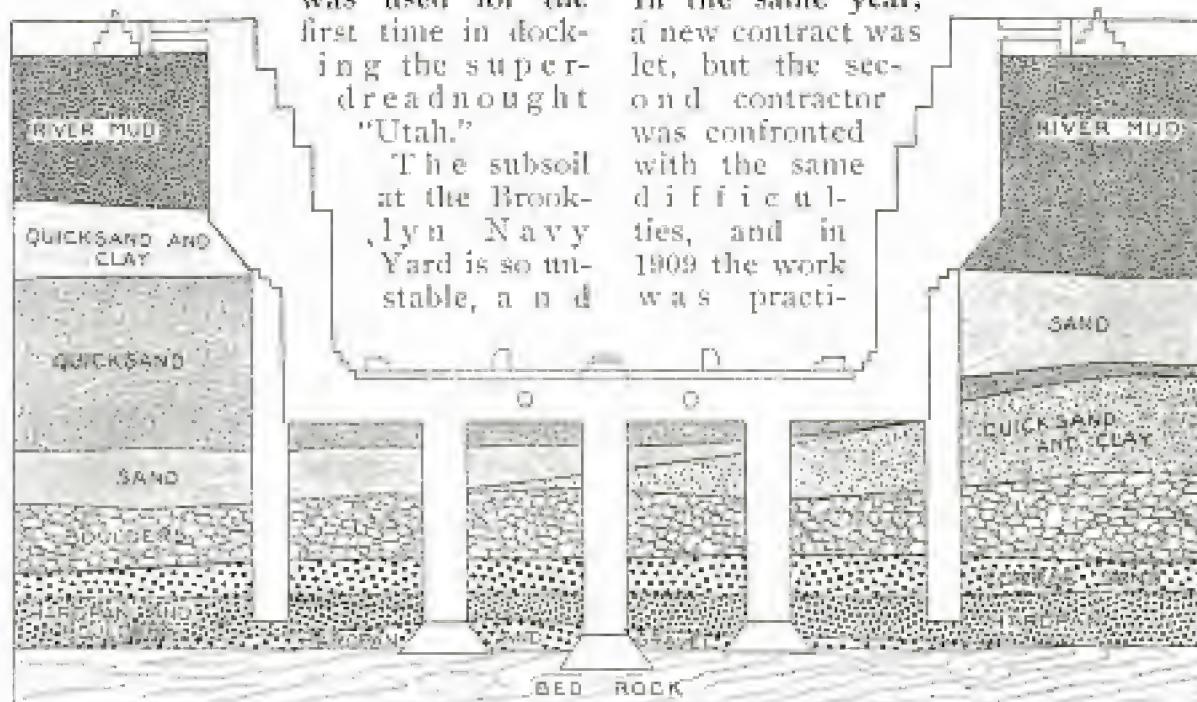
NAVY'S GREAT DRYDOCK AT LAST COMPLETED

The great drydock at the Brooklyn Navy Yard, the first appropriation for which was made in 1900, has at last been completed, after having been twice given up by contractors, and

was used for the first time in docking the super-dreadnought "Utah."

The subsoil at the Brooklyn Navy Yard is so unstable, and

the surface so extensively underlaid with quicksand, that the task proved a very difficult engineering work. The first contractor encountered shifting sands and abandoned the work in 1908. In the same year, a new contract was let, but the second contractor was confronted with the same difficulties, and in 1909 the work was practi-



The Navy's Great Drydock at the Brooklyn Navy Yard is Supported by Massive Concrete Piers Extending Down through Quicksand to Bed Rock. Length of Dock, 725 Ft.; Width, 110 Ft.

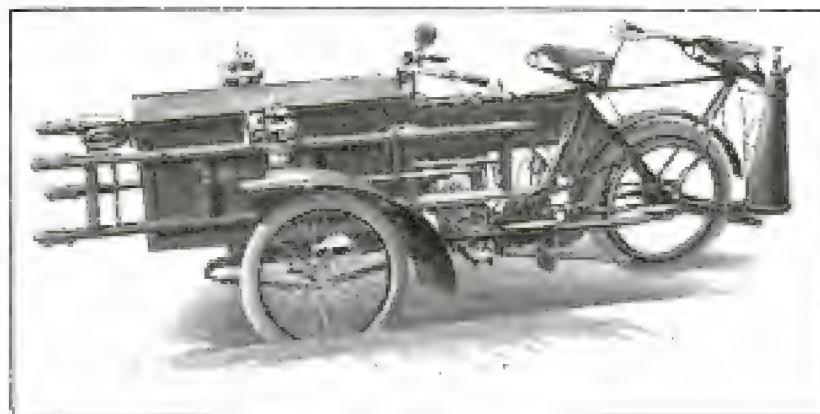
cally abandoned the second time. In October, 1909, the contract was awarded the third and last time, the contracting concern pushing it through to a successful completion.

The drydock as now completed is adequate for the docking of the largest battleships America is likely to construct for many years. The first contract called for a dock 554 ft. in length, capable of taking a ship 506 ft. long and 91 ft. beam. At the time of the second contract the size was increased to 620 ft. in over-all length, and the final contract was for a dock 726 ft. in length, with a width of 110 ft.

The plan of construction which proved successful was novel and somewhat radical for drydock construction. It consisted of sinking the outer wall of the dock to bedrock, or, where bedrock could not be reached by the pneumatic method, to the hardpan and boulders, and to carry the floor, which is 8 ft. thick, upon lines of massive piers, also sunk to bedrock. The outer wall was sunk in caissons, each 36 ft. long by 5 ft. wide. The floor-supporting piers, which are 7 ft. square, flaring out toward the base, which is 11 ft. square, were sunk in three rows.

AN ENGLISH MOTORCYCLE FIRE TRUCK

A motorcycle fire truck, exceptionally complete in its equipment, is used at the Beckenham fire station, London, for emergency work. The machine,



Motorcycle Fire Truck Equipped with Chemical, Hose, Scaling Ladders, First-Aid-to-the-Injured, Etc.

which is three-wheeled, has two seats, one for the driver and the other for the fireman; a fire extinguisher and hose, scaling ladders, and a "first-aid" equipment. The outfit can travel at a speed of 40 miles an hour, and has proved its practicability in rendering service before the arrival of the main fire-fighting apparatus.

The British post office has adopted the night-lettergram service for telegraph lines in the British Isles.

POWER PLANT SUPPORTS LAKE PLEASURE RESORT

Creating an artificial lake to provide a pleasure resort for the public, and paying for it by selling the electric power which will be developed, is the project now being carried out by the city of Austin, Texas. Construction is in progress on a reinforced concrete dam across the Colorado River at a point just outside the city limits, which will form a large artificial lake and provide a storage supply of water for generating a minimum of 6,000-hp. The dam will replace a similar structure that

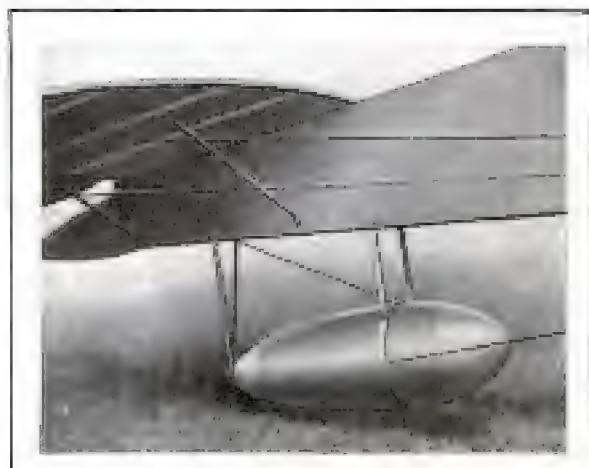
was erected about 14 years ago and which was destroyed by a flood in 1900. The new dam will be 5 ft. higher than the old and of a stronger type of construction. It will be 1,100 ft. long and back the water through a chain of picturesque hills for a distance of about 30 miles. This body of water will have an average width of about 1,500 ft., and a mean depth of about 40 ft.

While it is expected that this hydroelectric enterprise will be of much benefit to the people of Austin by pro-

viding cheap light and power, the primary incentive that brought about the arrangements for the construction of the dam was to establish a pleasure resort. The cost of the dam and power plant will amount to \$1,720,000, which sum the city has undertaken to pay, in semiannual installments, covering a period of 25 years, out of the revenue expected to be derived from the water and light plants, without having to resort to any bond issue.

THE FIRST HYDRO-MONOPLANE

The Nieuport hydro-monoplane, which underwent recent tests in France under the direction of Lieutenant Delage, is the first monoplane equipped for landing on and rising from the water. It will probably be one of the hydro-aeroplane types adopted by the French navy. The floats are of a novel design, not at all like the pontoons used on biplanes in America and in England. The two forward floats have hydroplane-type bottoms, and small wooden wings or planes extending out



The Tail of the Nieuport Monoplane with Its Elongated Egg-Shaped Support

like the fins at the back of a fish's head. The tail portion of the monoplane is supported on the water by an elongated egg-shaped float.

The final stone has recently been laid in the system of breakwaters in the harbor of Colombo, Ceylon, completing a work commenced in 1875, which cost \$15,000,000, incloses one square mile of water, and gives Colombo one of the largest artificial harbors in the world.



Front View, Showing the Supporting Floats of the First Hydro-Monoplane

ARTISTIC TRELLIS-WORK SUN ROOM

In the New York City residence of Mrs. E. H. Harriman is an exceptionally artistic sun room, done completely in trellis work of pleasing design. The



Courtesy International Studio

The Exceptionally Artistic Trellis-Work Sun Room in the New York City Residence of Mrs. E. H. Harriman

metal-work globes containing the electric lamps, the sculptured fireplace, and the wicker furniture give the whole a very delightful effect.

NEW YORK'S WATER SUPPLY STERILIZED WITH LIME

The sterilization of New York's water supply with hypochlorite of lime is, according to the Engineering Record, undertaken on a larger scale than ever before attempted. The plant at Dunwoodie will tap both the old and the new Croton aqueducts and apply a solution of the chemical to the water delivered each day to the Boroughs of Manhattan and Bronx. The daily flow thus sterilized may reach a maximum of 380,000,000 gallons.

This arrangement for sterilization is, of course, but temporary, pending the erection of a permanent filtration plant, for which plans are now in course of preparation.

MONSTER TUNNEL PROJECT FOR CENTRAL GERMANY

A railroad tunnel, from 15 to 19 miles in length, in the very heart of Germany has recently been proposed by the Braunschweig Commerce association.

The Harz Mountains form an obstacle in the way of rapid transit between points in northern and southern Germany, and as an ordinary road over the mountains would present very considerable technical difficulties, a tunnel is judged much more feasible, and the cost is estimated at the comparatively reasonable sum of \$6,000,000. An express train would be able to run through the tunnel in less than an hour and the gain in time for freight traffic would be of great value.

Beside these direct advantages, the surveyors of the projected tunnel are convinced that water courses will be met with during the tunneling which could be used for power purposes, and that many valuable ore deposits will be discovered, the Harz Mountains being one of Germany's richest ore-bearing regions. Silver, iron, lead, copper, zinc, etc., are mined at various points, and marble, alabaster and granite quarried.

GERMAN AIR-CRAFT INSURANCE

The several German life and accident insurance companies, which have been underwriting aerial risks during the past few years, are all at present restricting their operations, the experience up to date having proved discouraging. Rates of insurance against liability for damages, arising from injury to persons and property inflicted during flights, have been made almost prohibitive; insurance of aeroplane operators against death seems to have

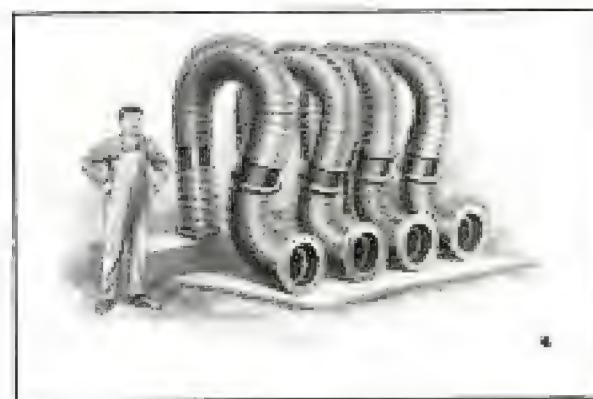
been abandoned altogether; the rates for insurance of balloonists have been recently increased, and at present the number of policies of any kind in this class is exceptionally small.

A Swiss insurance company doing business in Germany, which wrote about 100 policies during the two years it experimented in the field, has now abandoned all classes of aerial insurance. Its original rate against death was \$110 per year for a \$2,380 policy, and for an accident insurance giving a daily indemnity of \$2.40 during invalidity the same premium was exacted.

METAL "GOOSE-NECK" TUBES OF GREAT ELASTICITY

A Polish engineer, M. Maciejewski, has recently constructed a machine for producing flexible metal tubes or pipe, by means of parallel corrugations in the metal, for use as conduits of various kinds, and in fire-tube boilers. The tubes are so flexible that they can be easily bent into elbow or goose-neck shape, as shown by the illustration, from which the size of the tubes may be judged.

These tubes will effectively withstand internal shocks, such as water hammer, and the like, and their longitudinal elasticity naturally eliminates the necessity of expansion joints. It



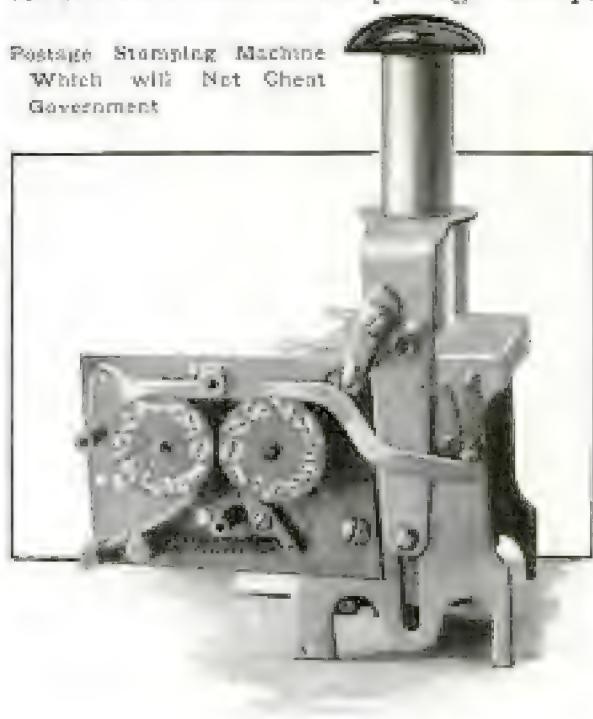
Polish Invention of Tubes Which may be Bent Into Goose-Neck Shapes

is claimed that a fire-tube boiler in which these tubes are used will cost considerably less than if built in the ordinary manner.

TO ELIMINATE THE POSTAGE STAMP

A little machine has been invented by a Los Angeles inventor which is intended to eliminate the postage stamp,

Postage Stamping Machine
Which will Not Cheat
Government



with the bother of licking the little labels or messing with a damp sponge. It should be of considerable value to the business man who sends out a large mail, and in the case of mail-order firms should effect a saving in time and energy on the part of clerks.

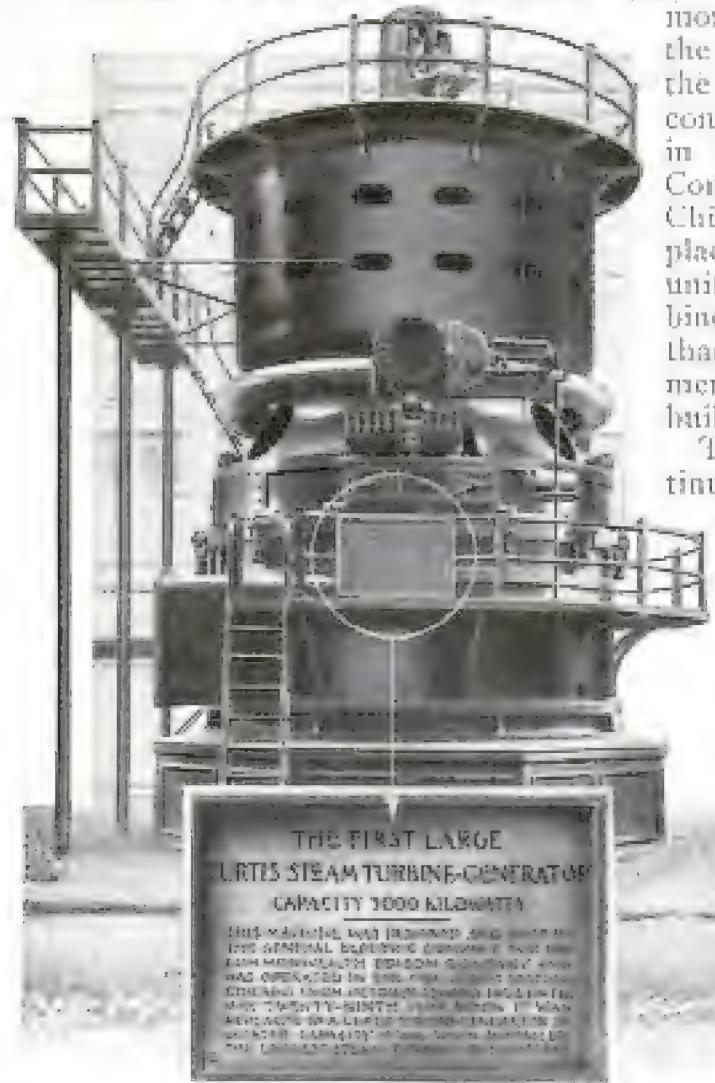
The device makes an imprint similar to the "postage paid" permits printed on envelopes, which have already proven their value and are in constantly increasing use. The difference is that this device can be operated in the office and imprinted on any envelope and used from day to day as required. It is locked after being set for a certain number of imprints and can be adjusted up to 10,000. When the given number of imprints has been stamped, no more impressions can be made until the case is opened and the machine reset. It is proposed by the inventor to have the Post Office Department authorize its use, and in that event the business man will secure a machine with any desired number of

imprints, paying for them as if they were so many stamps. Any denomination can be imprinted of course. In case the two-cent imprint is in use in

a given machine, overweight letters can be stamped with two or more impressions to make up the desired amount of postage.

THE FIRST GREAT TURBINE BECOMES A MONUMENT

The first great steam turbine, with its original stairways and galleries, now stands in the middle of a grass



The First Great Turbine Erected in Front of the General Electric Company's Schenectady Plant to Commemorate the Progress in Turbine Development

plot in front of the turbine department of the General Electric Company's plant at Schenectady, N. Y., as a monument to the development of the turbine. The machine is one of the three 5,000-kilowatt turbine units contracted for in 1901, and installed in the Fisk Street station of the Commonwealth Edison Company of Chicago, in 1903. Previous to the placing of the contract for these units there was not a generating turbine in the world of larger capacity than 1,000 kilowatts, and no commercial Curtis turbines had been built.

The "monument" was used in continuous service from 1903 until May, 1909, when it was replaced by a new and larger turbine, which now operates in the same space occupied by its predecessor, and which, from the same battery of boilers originally designed to provide power for generating 5,000 kilowatts, delivers 14,000 kilowatts for considerable periods of time.

The monument commemorates the great step in engineering which was marked by its installation as a power unit in 1903.

Steel trolley wire is a recent product of the wire manufacturers.

ELECTRICITY IN A LOS ANGELES FESTIVAL

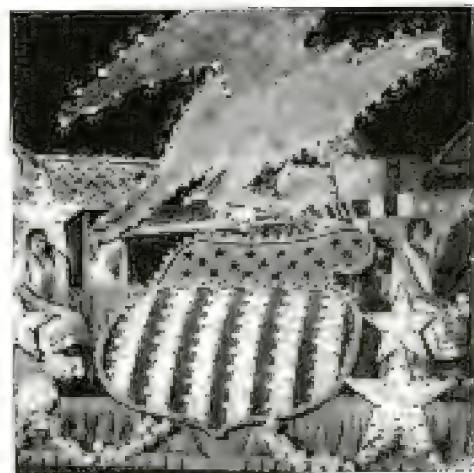
To the wonderful pageants of the carnival at Nice, the Mardi Gras of New Orleans, and the Midwinter Rose Tournament of Pasadena, must be added the Fiesta de los Flores of Los

Angeles, an event that takes place in the middle of May, when Southern California is at its best. This year the Fiesta was observed with unusual display, as it took place during the na-

tional conclave of the Shriners, and a whole week of festivity caused the regular business of the city to be suspended.

The finest feature of the Fiesta was due to electricity, for it was conceded that the electrical night parades were the most striking part of the entertainment. Fifteen floats, costing \$1,000 each, and carrying thousands of incandescent lights, were sent through the streets for three successive evenings. These floats were built upon trolley flatcars and were sent along the street-railway tracks the same as street cars, receiving power and light from the overhead wires, and dispensing with the horses that add nothing to the beauty of a pageant. The most weird and wonderful designs were chosen for subjects, such as the "Love Bug," "Giant Grasshopper," "Flying Fish," "Monoplane" and "Honey Bee." The "American Eagle" was one of the finest and most spectacular, with the huge golden bird mounted upon a red, white and blue shield, all the colors being masses of light.

By means of flashers, the light was sent in waves through the designs of some floats, such as the rocket, which gave the effect of bursting fireworks. Other floats had mechanical devices which moved the various parts; thus the fish appeared to be swimming, while the stork "rubbered" at the crowds on both sides of the street, and stretched its neck. Of course, pretty

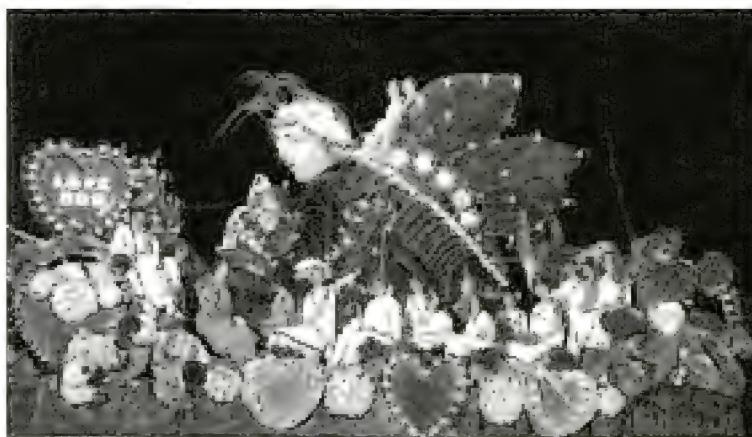


"American Eagle," Electric Float in Los Angeles Fiesta, the Eagle Standing on an American Shield

girls were in evidence upon the floats, and their charms afforded the only serious rival to the beauty of the electric display.

BLASTING RAIN CLOUDS WITH DYNAMITE

Sections of Texas which have been handicapped by drought have turned to the ancient scheme of using high explosives to blast moisture from the clouds and give dying crops relief from the burning sun. For weeks a large part of the great state was totally without rain. A northern manufacturer who has a large estate in one section of the state, when threatened with loss of his crops, bought \$1,000 worth of dynamite and sent up bombs filled with it. Copious rain followed. The apparent success that attended these efforts aroused the people of other sections. The residents of Wichita Falls made up a purse and purchased some 6,000 lb. of explosive. Wichita Falls was about to go bankrupt because of the lack of rain, and water was needed



The "Love Bug," One of the Floats in the Los Angeles Fiesta Which Obtained Weird Effect by Flashing Lights

forthwith. The dynamite was exploded in large charges, but no rain came. When the last of it had gone without result and the people were wondering what to do next, telegrams began to arrive from surrounding sections thanking the Wichita Falls people for their kindness, as rain in large quantities had fallen in many places, though not a drop had laid the dust in the vicinity of the town where the work to get it was performed. The Texas people have great faith in dynamite, however, and several communities have already subscribed to funds with which to purchase it and try to blow a few drops of rain out of the otherwise clear sky.

SHOOTING BUTTERFLIES WITH ARROWS

The great butterfly "troides chimaera," which often has a wing spread of 5 or 6 in., is hunted by the natives of



Courtesy Illustrated London News
Shooting Great Butterflies with Arrows
in New Guinea

New Guinea with bow and arrows. The arrows, which the natives also use for killing small birds, are four-pronged.

It is estimated that the Mississippi River has added 1,200 square miles of area to the continent of North America by the deposits it has made in the Gulf of Mexico.

WAVE-ACTION PRESSURES ON BREAKWATERS

It is a well-known fact that the impact of a wave on the face or top of a breakwater formed of blocks of masonry or concrete may cause such a block to become loosened from its seat and move in the opposite direction to that of impact, even to the extent of being actually pushed out of its position, although it may weigh several tons besides carrying the weight of adjoining blocks, states the London Times.

This effect may be explained either by assuming that wave pressure on the face of the breakwater at the instant of impact is transmitted, as in the hydraulic press, to every portion of the interior, thus giving rise to an excess outward pressure at those portions of the face over which the wave is not at the instant breaking; or by the compression of air which is entrapped in the open joints, such a compression causing an internal pressure, which is maintained for a short period of time after the recession of the wave has relieved the pressure on the face.

Experiments carried on at University College, Dundee, indicate that, assuming a maximum velocity of wave impact of 80 ft. per second, the maximum internal pressure to be anticipated through hydrostatic transmission of the impact is about 2.9 tons per square foot, while, in the case of air compression, the pressure may reach about 6 tons per square foot. The experiments also show that, in circumstances favoring such an effect, the impact of the wave on an open joint gives rise to a water-hammer action, far more violent than either internal water pressure or air pressure, and the force of which may amount to some 40 tons to the square foot.

It is suggested that a free outlet by means of a series of drains or weep holes, opening out on the sheltered face of the breakwater, be provided for the water that may percolate to the interior of such a structure, in order to relieve such strains.

THE SPIRIT OF THE MODERN WONDERS
MAN'S THOUGHT APPLIED TO
THE SERVICE OF MANKIND



"To the Ancients, a wonder had to be fashioned with the strong arm; its virtues were chiefly those of size and strength. The Modern Wonders find their inspiration in the service of human life—every human life—and their conception in minds, not in muscle."

EDITOR'S NOTE

THE Editor of Popular Mechanics Magazine invited nearly one thousand scientists, representing every European and American school of advanced thought, to participate by ballot in the selection of seven wonders of the modern world. A ballot was prepared containing 56 subjects of scientific and mechanical achievement. There were blank spaces for the insertion of any other subject the voter might desire. Each of the eminent men to whom the ballots were sent was requested to indicate the seven that appeared to him to be the most wonderful. He was under no obligation to accept any of those on the list. He was assured that his name would not be used in connection with the publication of the result, which, of course, precludes the printing of the list herewith.

The American scientists were selected after consultation with the Secretary of the American Academy of Sciences, Dr. L. O. Howard of Washington, D. C.; the European authorities consulted were members, either of the Royal Society of London, the French Academy of Science, or the faculties of the great German universities. The response received was cordial. About 70 per cent of the ballots sent out were marked and returned. These came from the most distinguished men of the entire group, the names of many of whom are household words throughout the civilized world. Several eminent men hesitated to select seven individual forms of progress as the most wonderful, and a number of letters were received commending the enterprise, but declining to put their writers on record for the reason that any titles selected would be, to their minds, in many instances results of some general element of modern progress, such as electrical development, chemical research or civil engineering, and not, therefore, entitled to place as separate wonders. A class of 50 professors, instructors and advanced students of the department of chemistry of Cornell University, by a supplementary ballot, selected a list of seven things, five of which are to be found on the list which represents the consensus of opinion of the entire voting. Only one ballot, the last to be received, which bore the name of one of the most distinguished authorities on chemistry of Munich, Germany, was checked for the seven titles the total vote showed to have been selected. Six ballots, one from India, two from France, two from Germany and one from the United States, showed the selection of six of the final seven. The international character of the poll and the wide diversity of opinion of the men chosen to participate in it resulted in some remarkable answers, and in a scattering of votes over a wide range of human achievement, so that the subject which received the largest number of votes was selected by a little more than 35 per cent of the scientists voting and the seventh on the final list by but a trifle more than 17 per cent. The final analysis of the poll shows the ten subjects highest on the list were:

Wireless Telegraphy	244	Spectrum Analysis	126
Telephone	185	X-Ray	111
Acroplane	167	Panama Canal	100
Radium	165	Anesthesia	94
Antiseptics and Antitoxins	140	Synthetic Chemistry	81

THE SEVEN WONDERS OF THE MODERN WORLD

Result of the International Poll of Scientists

- | | | |
|--------------|--------------|-------------------------------|
| 1. Wireless | 3. Aeroplane | 5. Antiseptics and Antitoxins |
| 2. Telephone | 4. Radium | 6. Spectrum Analysis |
| 7. X-Ray | | |

THE Seven Wonders of the Modern World!

It were a far easier task for even the learned men who shared in the selection to name seven score than seven. On every hand, by night, by day, we walk and see and breathe amid a multitude of wonders, which are no wonders to us, but only commonplace, because a part of our everyday existence. Today an infant's feeble voice finds its unerring way along a tiny wire across rivers and over plains and mountains to the one home in millions it seeks. To us no wonder, and our young men and women cannot recall the time before the telephone was. They use without a thought, an instrument before which the Seven Wise Men would have prostrated themselves as a thing supernatural.

The Seven Ancient Wonders were selected by the Greeks, and their right to the title was established before Christ was born. During all the intervening years no attempt has been made to definitely revise the "Seven Wonders." Generation after generation has come and gone accepting the decision one from the other. In fact there was no opportunity for a revision. As the years increased civilization ebbed and about all the man-made marvels we have to show for those 2,000 years of human life are a few cathedrals and pictures.

Of the ancient wonders only one was a practical utility—Ikaros, the 400-foot lighthouse of Alexandria; one was a hanging garden, not for the people, but built by a queen for her sensual pleasure; two were tombs; one was a temple of beauty devoted to a heathen god; another, the Colossus of Rhodes, was a freakish mass of cast metal, less than half the height of our own Statue of Liberty, and not comparable in dignity; and one was a beautiful statue to typify certain aesthetic ideals. Not a single one created for the uplifting or well-being of the masses.

As brute force, represented in vast armies, was the measure of power, so the Ancients honored the strong arm and the mighty, inert mass. It would seem that the pent-up forces of civilization, held in, thrust back, ruthlessly cut down for 20 centuries, had finally burst forth to fill the 19th century with wonders. And the greatest of these are neither connected oceans, mountains thrust through with tunnels, towering structures each housing the population of a city, floating palaces, land vehicles that outdistance the eagle, nor any of the things which typify the might of muscle. On the contrary each modern wonder is a monument to the might of mind.

As we move out into the 20th century we are pushed on by a tremendous

THE SEVEN WONDERS OF THE ANCIENT WORLD

- | | |
|----------------------------|------------------------------|
| Pyramids of Egypt | Temple of Diana at Ephesus |
| Ikaros of Alexandria | Statue of Jupiter by Phidias |
| Hanging Gardens of Babylon | Mausoleum of Artemis |
| Colossus of Rhodes | |

POPULAR MECHANICS

momentum of scientific and mechanical and physiological knowledge of which the Ancients were utterly incapable to even dream.

Shall we contrast the Ancient Wonders and our Modern?

The Panama Canal: An engineering feat so stupendous as to find its equal only in Nature herself—is not thought worthy to be one of the Seven Modern Wonders. And yet Colonel Goethals with his men and machines could erect a mass in a few weeks which would put to insignificance the Great Pyramid, to build which required 100,000 men for 20 years. And when completed it was only a resting place for a few human bones which have long since been desecrated and scattered. The Panama Canal will for all time be of real service to all the peoples of the earth and to republics yet unborn, bringing food in time of famine from lands of plenty to those in want, and by reason of accessibility make alien nations neighbors. Yet this accomplishment with all its mighty possibilities is less a wonder than the story brought by a single ray of light from the smallest star as related by the Spectrum Analysis.

The Hanging Gardens of Babylon—the artificial mountain in a monotonous plain—built by slaves; devoted to the riotous revelry of a wicked court; its beauty known throughout the world: Yet this lofty, hand-made height sinks into smallness beside a single phial of antitoxin as it triumphs over the disease of some poor unfortunate outcast whose pain-taxed body the ambulance rescues from the slums.

What is a cold marble statue, however beautiful and stately, to those quivering waves which Marconi snatched from out of space and wove into invisible chords that tether the ships of the seas to ten million firesides!

What even the beauties of the Temple of Diana to the beauties and yet unknown blessings of radium?

The wonder of our Modern Wonders is the thing itself—not the instrument. To the Ancients, a wonder had to be fashioned with the strong arm; its virtues were chiefly those of size and strength. The Modern Wonders find their inspiration in an improvement of human life—every human life—and their conception in minds, not in muscle.

The Seven Wonders! century, when the scientists of view the seven wonders which ably we can as little forecast Wonders of the Then, as the could comprehend the things conquests we reach out with the same feeble to those greatest of all recorded in the first



Alexander Graham Bell's First Telephone



Essential Parts of First Bell Telephone — 1876

Modern Telephone Instrument

What will they be in the 40th those days look back and re-we select today? Unquestion-or comprehend the Seven Ancients, brought to life today, we know. With all our vaunted into twenty centuries yet to come comprehension that takes us back Seven Wonders,—the wonders chapter of Genesis.

H. H. WINDSOR

THE TELEPHONE

By ALEXANDER GRAHAM BELL

Inventor of the Telephone

HE period that marks the incipiency of the telephone was the years 1874 to 1877. From 1873 until the beginning of 1876, I was a resident of Salem, Mass., and came into Boston every day for my professional work. Then I would spend my summer vaca-

tions in Canada, at Brantford, Ontario, the home of my parents. So these three places, Salem, Boston, and Brantford, are concerned in the early days of the telephone. Boston is par excellence the home of the telephone, for it was there that all the apparatus was made and the important experiments carried on. Brantford was my thinking place, where I would go and spend my summer holidays and review the line of experiments made in Boston, and plan for the future of the work.

Right in the beginning I want to state that while I invented the telephone, credit for much of its development belongs to a number of able and conscientious co-workers, and men who came into the work later.

During the summer of 1874, while on a visit at my father's home at Brantford, and discussing with my father the numerous experiments I had made relative to the reproduction of musical sounds by electricity for the purposes of multiple telegraphy, the thought of the membrane telephone was elaborated. So that the conception of the telephone originated in Brantford. It was a theoretical conception of the magneto telephone,—that the vibrations of the voice might create electrical impulses like the aerial impulses and produce an audible result at the other end.

To tell the truth, as a practical man, I did not quite believe it; as a theoretical man, I saw a speaking telephone by which we could have the means of transmitting speech and reproducing it in distant places. But it really seemed too good to be true, that one could possibly create, by the action of the voice itself, electrical impulses intense enough to serve any practical purpose.

And so, on my return to Boston, in October, and all through the winter and spring of 1875, instead of making the apparatus and experimenting, I was attempting to devise methods of increasing the strength of these electrical undulations. Then came the discovery that a magneto-electric current would produce by itself sonorous effects at a receiving station. In a moment all the difficulties in the way of a practical solution of the telephone disappeared. We had only one membrane telephone, and the receiver was one of the old tuned-reed receivers. It was held up to the ear and you crammed the armature against the ear to dampen its vibrations. I was listening at the armature while Mr. Thos. A. Watson, my assistant, was in the basement of the building on Court Street, Boston, shouting at the membrane telephone. I may say that I heard nothing. Then we changed instruments and he listened while I spoke, and while I was thus engaged, Mr. Watson came rushing upstairs in a state of great excitement, saying, "Why, Mr. Bell, I heard your voice very distinctly and could almost understand what you said."

Well, that was gratifying, but it



Courtesy of the Bell Telephone Company
Professor Alexander Graham Bell

would have been still more gratifying if I, too, could have heard that. The workshop in which we were experimenting was a very noisy place and Mr. Watson was accustomed to that noise and could hear a good deal better than I could. I was more accustomed to throwing out my voice than Mr. Watson, so that he had the advantage of me in hearing and I had the advantage of him in speaking. The results would be considered very unsatisfactory at the present time; yet, encouraged by the results, poor as they were, I went ahead immediately to prepare specifications for a patent. The specifications for the patent were ready in October, 1875, but were not filed until later.

After the granting of the patent came a period of publication. In cases of new inventions, we are generally led to believe that the public is ready to swallow anything, and that grave scientific men are the most skeptical of all. In the case of the telephone I found this not to be true. The public generally and the business men of the country were very slow to perceive any value in the telephone. The scientific world, on the other hand, took it up at once.

The telephone was exhibited at the Centennial Exhibition in Philadelphia in 1876. I must admit that at that time I was not very much alive to commercial matters—not being a business man myself, but conducting a school of vocal physiology in Boston. I was right in the midst of examinations. My pupils, those studying under me, were working to become teachers of the deaf, and I could not be bothered at that time by having to go to Philadelphia and attend the exhibition. I finally decided, however, that I could take a Sunday off, and run down to Philadelphia. I was an unknown man, and looked around upon the celebrities who were the judges there, and followed them while they examined this exhibit and that exhibit. Mine came last. Before they got to it, it was an-

nounced that the judges were too tired to make any further examination that day. That meant that the telephone would not be seen, for I had resolved to return to Boston immediately.

And that was the way the matter stood, when suddenly there was one man among the judges who happened to remember me by sight. That was no less a person than Dom Pedro, then Emperor of Brazil. I had shown him what we had been doing in teaching speech to the deaf in Boston, and when he saw me he remembered me.

"Mr. Bell, how are the deaf-mutes of Boston?" he asked. I said they were very well and told him that the next exhibit on the program was my device. "Come along," he said, and he took my arm and marched off with me, and, of course, where an emperor led the other judges followed. And thus the telephone exhibit was saved.

The emperor held the receiving end of the line and I was told that he suddenly started and said, "My God, it speaks." He put it down, and then Sir William Thomson, the great English scientist, took it up and listened. I have reason to suspect, from some contemporary documents I have examined, that this was not quite what happened, but as I was not present at the receiving end of the line I cannot of my own knowledge state what did take place. I was at the transmitting end and suddenly I heard a noise of people stamping toward me and there was Dom Pedro rushing along at a very un-emperorlike gait, followed by Sir William Thomson and others, to see what I was doing at the other end.

Developments followed rapidly and the first reciprocal communications occurred in Boston, in 1876. On October 9, that year, the first conversation by telephone between persons separated by miles of space took place. This was between a manufacturing company in Cambridgeport and its office in Boston. It was not a very long distance, probably 2½ miles, but communication was carried on freely.

WIRELESS

By F. MINTURN SAMMIS

Chief Engineer in America of the Marconi System and Assistant to Marconi in the Early Improvements of the Original Invention

S wireless telegraphy grips the imagination of men more and more by its ever growing wonders, so does the marvel increase that its inventor developed and achieved his epoch-making idea when he was in age but a schoolboy, expected to do no more than study his lessons and enjoy himself. Guglielmo Marconi studied at the universities of Bologna and Padua, and when only 15 years old, on his father's estate near Bologna, Italy, plunged enthusiastically into the dreamlands of electricity. In the course of the next few years he headed straight for one of its great mysteries, the so-called Hertzian waves, or electrical impulses which could travel through air without the use of a wire. In 1895, when he was only 20 years old, his advanced knowledge on this obscure subject inspired him with the theory that these waves could be sent out and received at will, and in that year he had constructed the first wireless apparatus, whose efficiency astonished even his enthusiasm.

Wireless telegraphy under the masterful hand of Guglielmo Marconi sprang into commercial success in a remarkably short space of time. Prior to 1895, electromagnetic waves had been discovered, and men of many countries had experimented with them, but it remained for Marconi to see that these waves could be harnessed and made the servant of man, that they could be made to transmit intelligence from ship to shore and from one continent to another.

The waves or vibrations that make wireless telegraphy possible are in many respects similar to those of light.

They travel at the same tremendous speed of 186,330 miles a second. There are several ways of producing these waves, but the one in common use is called the spark method. Briefly, it is this: An induction coil or high-tension transformer is connected to an electric-current supply so as to produce a spark across an air space. By opening or closing an ordinary telegraph key the operator causes a spark of longer or shorter duration to jump across the air space. This spark produces the vibrations by virtue of its oscillatory character. In other words, it acts similarly to a straight spring drawn back and suddenly released. It vibrates to and fro until its energy is exhausted and the rate at which it vibrates is determined by its length. By varying the rate of vibration longer or shorter waves may be produced. By means of a device, called the oscillation transformer, the vibrations are transferred from the primary circuit to the aerial or masthead wire, always conspicuous at any wireless-telegraph station, thus performing the same function relative to the spark-gap circuit that a radiator does to a steam-heating boiler.

That which is called "tuning" has to do with the adjustment of the wave length of the aerial wire to that of the closed circuit. In this manner a receiving station may be tuned to a transmitting station or, in other words, the instruments of the former so adjusted that they will be more sensitive to the waves from the latter than to those from other stations.

In the receiving system the same aerial wire and a smaller oscillation transformer are used, but in lieu of



Guglielmo Marconi

the spark gap we have the detector. This detector may consist of a special form of glow lamp, called an oscillation valve, or of a mineral or crystal such as silicon or carborundum, or other devices. However constructed, the various detectors serve the purpose of causing an intermittent current to flow through the operator's telephone receivers, thus producing audible dots and dashes, corresponding to the shorter or longer duration of the impulses sent out by the transmitting station. This brief account describes with fair accuracy the commercial, tuned wireless system of today.

At the present time there may be found stations a thousand miles up the Amazon River working 500 miles over land through the virgin forest, and

huge commercial stations flashing thousands of words daily across the broad Atlantic, and yet the art is still in its infancy. Mr. Marconi, ever looking for new worlds to conquer, and confident in his ability, gained by years of hard work and painstaking experiment, is about to start the work of erecting 11 huge stations that will completely encircle the world.

There is something fascinating and inspiring about the pioneer work of any great achievement, and the writer feels that he has been honored in having a part in the early development in the United States of so important an art as that of wireless telegraphy. It has been particularly pleasant to have been engaged in this work as one of Mr. Marconi's engineers.

THE AEROPLANE

By ALBERT F. ZAHM, M. E., Ph. D.

*Chairman of the Aerodynamic Committee of the Aero Club of America,
and Leading American Authority on the Scientific Side of Aviation*



THE aeroplane is the invention of the nineteenth century, and the fruition of the twentieth.

Its essential features are mainly of English origin. In 1809 and 1810, Sir George Cayley, the father of the aerial glider, published ac-

counts of his models which coasted down hill slopes in good balance, fore and aft and laterally. He determined the power expended by gravity in such flights, and estimated the weight of motor required for dynamic flight.

In 1842, Samuel Henson patented a monoplane having all the mechanical features essential to successful flight, a motor, screw propellers, wheeled chassis, trussed wings of sufficient curvature, covered above and below, horizontal and vertical rudder, Voisin-like vertical keel for inherent lateral stability. Four years later, his col-

league, Stringfellow, built a steam-driven monoplane which ran down a stretched wire, and darted off into the air "in as fair a flight as it was possible to make, to a distance of about 40 yards." In 1868, he built a triplane model driven by twin screws actuated by a steam engine inclosed in a streamline body. Vertical posts and diagonal stay wires, now so common, were used in the trussing.

The aeroplane glider with superposed plane surfaces was patented in England by Wenham in 1866, and with superposed concave surfaces, by Phillips in 1884. Phillips at that date had determined, by use of a wind tunnel, the value of various favorable concave forms of wings very like some of the best in use today.

The present three-torque system of control, comprising a vertical rudder, a horizontal rudder, and a pair of ailerons operable by hand or automatically, was given to the world by Boulton of England, in 1868. Systems of torsional wings together with vertical

and horizontal rudders for controlling flight were publicly described by Ader in France, and the present writer, in 1893. Skids for landing were shown on Ader's machine at about the same date. Floats for starting from water were used by Kress, of Vienna, in 1898. Patent specifications for a complete hydro-aeroplane with two floats and the three-torque system of control were drawn by Mattioliath, of New York, in 1899; the claims being allowed subsequently.

Before the close of the nineteenth century, the gasoline engine had been proposed for aeroplane propulsion, and several were actually constructed for that purpose. In 1898, Balzer, of New York, undertook to build for Langley an air-cooled five-cylinder rotatory gasoline engine of 12 horsepower, weighing 100 pounds. From this as a start, Manley built for Langley a radial five-cylinder fixed gasoline engine of 50 horsepower, weighing 200 pounds. This was the first motor in history adequate to propel a passenger aeroplane in prolonged flight. It was designed in 1900 and completed in 1907, after experiments with a quarter-size model.

Having traced the origin—mainly English—of the chief important features of the aeroplane, we may next trace the progress in utilizing them.

The passenger gliding machine was first successfully used by Lilienthal, of Germany, then by Pilcher, of Glasgow, and by Chanute and Herring, of Chicago, who perfected its trussing to the modern form of concave biplane. These were all balanced by the rider shifting his weight as he hung beneath the surface in flight. Subsequently the Wright brothers used a biplane glider, and Professor Montgomery a monoplane glider, in which they made successful flights by using the three-torque system of control, previously invented by others. The ultimate aim of the human glider was to achieve soaring flight; but this has not yet been satisfactorily accomplished.

As to the first human power-flights,

Ader is reported to have flown 150 feet in 1890, in a wheel-mounted monoplane driven by a steam engine actuating twin-screws, and Maxim, three years later, rose from a track in a steam-driven multiplane, weighing 3.5 tons and lifting more than a ton of extra load. Neither machine was suitably proportioned for stable and steady flight.

On May 6, 1896, Langley launched a steam monoplane model which flew over 3,000 feet with good inherent stability. On August 8, 1903, he launched a gasoline model monoplane which flew with good stability and ample reserve power for a voyage of many miles. It was the first successful gasoline aeroplane in history. On September 7, 1903, Langley launched the first gasoline passenger aeroplane of adequate stability and power for prolonged flight.

On December 17, 1903, the Wright brothers successfully launched a gasoline-driven aeroplane, which carried a passenger 59 seconds and landed safely. Three short flights were made that day. These famous trials satisfied the witnesses and many others that the aeroplane "had come to stay." Their aeroplane was controlled by an embryo and dangerous three-torque system, in which the vertical rudder was compelled to turn in proportion to the warping of the wings. The independent working of the wings and rudder system was practically introduced in subsequent years by the Wrights and by Montgomery, though previously invented and patented by others.

In the winter of 1911, Mr. Curtiss made the first successful flights from water in a hydro-aeroplane, thus adding a new and most valuable realm to the dominion of aviation.

We have thus briefly sketched the growth of this wonderful vehicle of the air from the time of its first inventors, scientist Cayley and engineer Henson, through its many radical improvements to the present day. It is truly a century-long creation, still in the experimental state, and far from

commercially practicable. But though still an "enfant terrible," the aeroplane has achieved excellent records. It has attained a speed of 104 miles an hour in a closed circuit, has flown nearly 14,000 feet high, and has carried 13 passengers at once, their weight aggregating 1,440 pounds. It has flown through storm clouds, over mountains,

seas and continents. It has voyaged by compass over inhospitable routes, from city to city, faster than the eagle or the railway locomotive. When finally perfected sufficiently for regular transportation, who will be called its inventor, and what will be its rank among the marvelous mechanical triumphs of human genius?

THE X-RAY

By ROBERT WILLIAMS WOOD

Professor of Experimental Physics, Johns Hopkins; Honorary Fellow of the Royal Microscopical Society; Fellow of the London Physical Society; Investigator of X-Rays at Their First Development in Professor Röntgen's Laboratory in Berlin, and the First American to Take X-Ray Photographs



DISCOVERY of the X-rays resulted from the accidental observation made by Prof. Wilhelm Conrad Röntgen, of the University of Würzburg, that certain crystals, in the vicinity of a vacuum tube with which he was experimenting, glowed with a phosphorescent light, even when opaque substances were interposed between the tube and the shining crystals. Further experimenting showed that the tube was giving off a radiation, which though quite invisible to the eye, had the power of affecting photographic plates, and passed through flesh and bone, metal plates, blocks of wood, and practically all opaque substances, almost as readily as light passes through a sheet of glass.

This remarkable and epoch-making discovery was announced to the world in a paper of perhaps a dozen pages, published in the proceedings of the Würzburg Academy, a journal rarely seen or read outside of Germany, and not occupying a conspicuous spot in the reading rooms even in that country. It was more than a year before it was republished in the "Annalen der Physik," one of the three leading physical journals of the world.

As it happened, I was engaged in graduate study at the University of Berlin at the time the discovery was made, and one morning, as I passed through the laboratory, one of the junior professors called out to me, "Oh, come in here and see the pictures; they are most extraordinary, and were made with a new kind of ray which Röntgen has discovered." Together we went into one of the smaller laboratories, where, hanging on the wall was a row of photographs, such as we are now familiar with, but which at the time were perfectly startling. Pinned up beside them was a copy of the short paper to which I have referred, which explained how the pictures of the bones in the hand, and the coins in a purse had been made.

We all commenced experimenting at once. Within a week the laboratory buzzed with the news that the emperor had commanded Professor Röntgen to exhibit his experiments at the palace, and that he would set up the apparatus in the Physical Institute in Berlin before taking it up to Potsdam. A week or two after this event, a second short paper was published in the same obscure journal, outlining further prop-



Prof. R. W. Wood

erties of the new rays, and then nothing more, for there appeared to be nothing more! So much for the discovery of the rays.

It is indeed a noteworthy fact that practically everything we know about these remarkable rays was contained in the two brief papers published by their discoverer. This happened 15 years ago, and it is only within the last year or two that any new matter of importance concerning them has been contributed to the scientific journals. As to their nature we are still somewhat in the dark, though there appears to be a good deal of evidence that they are waves in the ether similar to light waves, only very much shorter. They are generated in a glass bulb from which the air has been exhausted, provided with two electrodes which are joined to the terminals of a powerful induction coil. From the cathode terminal shoot out, with a velocity nearly equal to that of light, electrical corpuscles which, when they strike the platinum plate or anticathode, make splashes in the ether which radiate outward from the surface of the plate as X-rays.

If I am asked why they constitute one of the seven wonders of the modern world, I am afraid that I shall not be able to give a wholly satisfactory answer, for as a matter of fact, they are not nearly as wonderful as light, for the simple reason that they have fewer properties.

The X-rays are wonderful to the majority of us simply because "they photograph our bones," but this does not make them wonderful to the physicist. If we had no bones would the X-rays have received such a heavy vote? They are neither refracted nor reflected and can form images of objects only as a small candle casts a shadow on the wall, and they have few or none of the other remarkable properties of light. They do not, however, exist in nature, and this, to my mind, is what entitles them to a high place among the modern wonders. Light, heat, electricity, and even the cathode rays exist in nature, but no trace has ever been

found of X-rays generated by cosmic forces. They issue only from the man-made vacuum tube; they may be said to have been created by man out of



First X-Ray Picture Received in the United States.
Dr. Wood's Hand Taken in Röntgen's Laboratory
in Berlin

nothing, for are they not generated in a vacuum?

They have, however, one property which makes them wonderful to the physicist, namely, their ability to pass through thick plates of metal. All other forms of radiant energy in the ether, electric waves, heat waves and light waves are stopped by even very thin films of metal. True, light is able to struggle through the thinnest gold leaf, but the X-ray will pass through a slab of aluminum an inch thick. This is, I think, their most wonderful property, and is much more startling than their ability to pass through leather, wood, brick and stone, for these are opaque to light more as a result of their structure and accidental peculiarities, than of their inherent atomic structure, while the flesh of animals is quite transparent to light, though to a much less degree than to X-rays.

ANTISEPTICS AND ANTITOXINS

By E. E. HYDE, M. D.

Of the Journal of The American Medical Association

"When man learnt how to protect himself from the wild beasts," says a French writer, "he made the first step in civilization. Today man is learning how to defend himself from the microbes—a step of equal importance. A day will come when in Berlin, in London, in Paris, man will not die of diphtheria, of typhoid, of scarlet fever, of cholera, or of tuberculosis, any more than he dies in these cities today from the venom of snakes or from the fangs of wolves."



WHEN by patient experiment the germ theory was proved true, the key had been found which was to release the South from the thrall of yellow-fever quarantine which yearly paralyzed its commerce; to free our army from the bondage of diseases which slew more soldiers than did bullets, and to unlock the barrier that held Atlantic and Pacific apart at the Isthmus of Panama.

Although the communicability of many diseases has been recognized from earliest history, it was not until about 1860 that Pasteur in his garret laboratory proved the dependence of fermentation, putrefaction and decay on the presence of minute organisms. Up to this time, as Velpeau remarked, "a pin-prick was a door for death." Almost all surgical wounds suppurred, and the suppuration, which no one could explain or prevent, was so often fatal that a conscientious surgeon advised his pupils to think ten times before undertaking an apparently necessary operation.

Lister, pondering over Pasteur's discovery, conceived the idea that if microbes could be killed or excluded from the field of operation, the mortality and suffering from surgery might be reduced. Thus was antisepsis introduced to surgery. Whereas the death rate in compound fracture was two out of three before the days of antisepsis, today it is less than one in fifty; and, whereas in the old days operation was followed as a rule by rotting sores, lockjaw, gangrene, and

by death in an appalling proportion of cases, today with antisepsis the surgeon may open almost any cavity of the body, and the wounds will heal in almost every case without a drop of pus. Hospital gangrene, erysipelas and blood poisoning, once the scourges of hospitals and army camps, are now almost unknown after operation.

A most spectacular example of the transformation of the practice of medicine is the solution of the yellow-fever problem, saving millions of dollars in southern commerce and eliminating the costly and often brutal quarantine. A Havana physician, Carlos Finlay, had stubbornly maintained that the germ of this disease was communicated to man only by the bite of mosquitoes. To prove this, during the American occupation of Cuba, the Yellow Fever Commission, composed of Drs. Walter Reed, James Carroll, Jesse W. Lazear, and Aristides Agramonte compared the results of definite contact with yellow-fever patients' clothes and discharges with those of bites by mosquitoes which had previously bitten yellow-fever patients. Volunteers submitted themselves to the experiments. No one contracted the disease except from the bite of a mosquito. This heroic test formed the basis for the new method of dealing with the disease, and it has been almost abolished.

The germ theory has enabled us to establish two lines of defense against disease, one inside and the



Dr. E. E. Hyde

other outside the body. Our first effort is naturally by cleanliness and care to avoid admitting these tiny enemies in such numbers that they can carry the body's citadel. Suppose, however, that the sentries have been unequal to their duty or the portals too numerous to be guarded; must the day be lost? By no means; where we cannot absolutely prevent infection we can increase the body's resistance to disease.

It seems that the animal body tends to cure a germ disease by creating a substance antagonistic to the germs. It was most natural, therefore, to attempt not only to increase this substance and thereby hasten recovery, but also to cause an artificial immunity in a person who might later be exposed to the disease. To take a concrete instance: Typhoid is caused in most cases by the drinking of water or milk contaminated with discharges from typhoid patients. Therefore, the first means rationally to be adopted against it is cleanliness in regard to

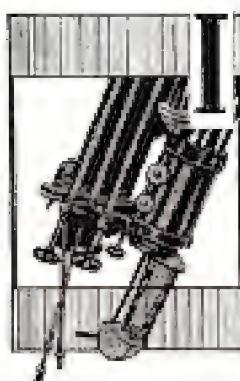
food and drink. It is difficult, however, under some circumstances, to guard all avenues of possible infection. Soldiers on a campaign, for instance, are exposed to almost greater dangers from uncleanliness than from bullets; thousands in our army were sick and hundreds died from typhoid during the Spanish-American war. That was before the days of antityphoid vaccination. About a year ago, under conditions similar except that the men had been vaccinated against typhoid, army maneuvers were held in Texas. Two men contracted typhoid; none died.

"It is in the power of man," said the great Pasteur, "to make all parasitic diseases disappear from the earth." That prophetic utterance is in process of fulfillment; and greatly privileged are they to whom it has been granted to speed the coming of a better day, and to delve into the deep secrets of God's wonderful world, to find out laws that He created before He made man himself, and to write them large that the world may joyfully obey.

SPECTRUM ANALYSIS

By DAVID TODD, A. M., Ph. D

Fellow Royal Society of Arts, Professor of Astronomy, Amherst College



If the wireless is a wonder-worker through the ear, no less is the spectroscope to the eye; by waves in the same ether both instruments become operant, and convey their message to us.

Although not so widely practical as the wireless, nevertheless the spectroscope is really more wonderful; for the wireless only receives the wave impulse and transmits the same unmodified. But the spectroscope has the marvelous power of classifying a confused jumble of light waves into orderly sequence, so as to signify what

the original source of the light is, and what conditions it encounters in passing to the eye.

Newton was the first to philosophize on the effect a glass wedge or prism has upon a beam of light sent through it: not only is the beam changed in its direction, but the prism transforms the seemingly simple white sunlight into a marvelously beautiful rainbow band, or ribbon of colors, to which Newton gave the name "spectrum." White sunlight, then, is not the simple thing it appears, but is compounded of all the colors of the



Prof. David Todd

POPULAR MECHANICS

rainbow. Basic as this discovery was, however, it remained for Fraunhofer, a century and a half later, to follow it up. What he discovered was this: running across the colors of the solar spectrum at irregular intervals are dark, parallel, colorless bands of varying breadth, the "Fraunhofer lines" as they have ever since been known; and he was the first to chart their position accurately.

Nearly half a century later, Kirchhoff succeeded in showing that their number and intensity, but more especially their position in the spectrum, were what really counted; so that if a substance in the form of vapor were concerned in producing light, its presence could be infallibly recognized by its particular spectral lines. Another marvel is that such excessively minute particles of elementary substances are detectible; one fifty-thousandth of a milligram of calcium, and even one fourteen-millionth of a milligram of sodium [1 milligram—0.0154 grains], being recognizable in the spectrum of a Bunsen flame, in which they are volatilized. Bunsen and Kirchhoff together formulated the principle that it matters not whether light examined by means of the spectroscope emanates directly from a glowing gas, or, coming from some extraneous source, simply passes through that gas; the lines characteristic to the substance will be in exactly the same position in the spectrum. By this great discovery spectrum analysis became a science.

The spectroscope is an engine most delicate and at the same time most powerful for research in chemistry, biology, meteorology, physics and astronomy. Many new chemical elements have been found, a research in which Ramsay has led. The vibratory motion of the molecule, and the basic relation of matter to the luminiferous ether have been investigated. The spectroscope has helped in a study of the circulatory functions in the living plant and animal. Industrial processes, too, have been greatly benefited, as the introduction of important improvements in manufacturing steel.

But the greatest wonder is bringing the stars to us so that we know what they are made of. So incalculably far away that even in the largest telescopes they show only as the tiniest points, we nevertheless find out with absolute certainty just what elements are the sources of their distant light.

Sir William Huggins was quick to see that mere distance of the light source made no difference in the character of the spectrum; and he first examined a star's spectrum half a century ago. All the fixed stars are shown to be bodies of exceedingly high temperature, and self-luminous like our sun. Scattered everywhere throughout the universe, too, are the same elements that we know on earth. The absolute temperature of the sun and numerous stars has been ascertained. Ultimately, the stars must yield their relative ages to the spectroscope. So, too, the physical constitution and life history of the nebulae are revealed; and even the wizard comets, though freaky in their manifestation, are found to contain well-known elements.

But another fundamental principle set forth by Doppler has been even more fruitful; that the spectral lines of a body radiating light are fixed in position only when that body is at rest with reference to the earth. If moving away from us, its lines are shifted slightly red-ward in the spectrum; if coming toward us, violet-ward. Elaboration of this simple principle has led to an astounding expansion of research in astro-physics, known as "radio-velocity work," and we find the cosmos everywhere alive with motion, whose direction and amount for all the brighter heavenly bodies the astronomer has already ascertained.

Because the two members of a very close double star are periodically moving toward or from us, we find, from the doubling of their spectral lines, how long it takes them to revolve round each other, although no telescope is powerful enough to reveal the components; because the spectroscope shows that stars in the general neighborhood

of Sirius are going away from the sun, while those in the opposite region of the sky, near Lyra, are coming toward us, we are able to ascertain anew the direction of interstellar drift of the sun with his planetary family, and that the speed of this motion is about 12 miles per second. Because in its yearly orbit round the sun our earth is at one season going directly toward a certain star, and six months later directly away from it, the spectroscope fixes the rate of that motion, thus giving the exact size of the orbit, and so the sun's distance, or the unit of cosmic

measure. In such ways the science of the stars has been revolutionized by the spectroscope and the whole universe becomes the familiar haunt of the astronomer, who tells us that outermost space is filled with substances precisely like those of which our earth is composed. Ultimately, too, the spectroscope will no doubt afford the last word on that greatest of all problems in physical science, the order of the cosmos, or the origin and distribution of the unnumbered millions of stars throughout the celestial spaces.

RADIUM

By HERBERT N. MCCOY, B.S., Ph.D.

Professor of Chemistry, University of Chicago; Researcher and Author on Radioactivity



MONG scientists, it is very generally conceded that the discovery of radium gave to the world one of its most interesting and unique riddles. After all the "cranks," as well as geniuses, had failed to produce a perpetual-motion machine; after all the alchemists and their scientific successors, the chemists, had failed to change any single chemical element into another, and the world had settled down to the belief in the impossibility of achieving either of these aims, the discovery of the phenomena of radioactivity seemed to show the fallacy of the conclusion in both cases.

The discovery of radium was the logical result of the attempt of Becquerel, in 1900, to find a chemical substance which would produce X-rays. This famous French scientist seemed to have succeeded when he found that all compounds of the rather rare element uranium gave rays that, like X-rays, could penetrate light-proof

screens and act upon photographic plates. A very remarkable fact was then discovered: the ores of uranium were far more active than their uranium content would lead one to expect. This discovery led Mme. Curie, the brilliant young wife of Professor Curie, Becquerel's colleague, to search for other active substances than uranium in such minerals. After two or three years of most difficult work, from a ton of ore as much radium as could be heaped upon a dime was obtained, in the form of pure radium chloride, a white crystalline substance over a million times as active as an equal weight of uranium. A bit of this radium no larger than a pin head could produce a photograph in a minute or two. The radium itself glowed faintly in the dark and caused certain minerals, as zinc blende or diamonds, brought near it to glow quite brilliantly. Viewed with a magnifying glass, the glow of the zinc blende is seen to be due to numer-



Prof. H. N. McCoy

ous distinct sparks or scintillations, each visible for but a moment.

Not only light, but heat also is produced. At first it was thought that this heat was produced continuously and with no apparent diminution or loss of radium as time went on. This led to the statement that radium was a source of perpetual energy. We now know that the rate of heat production is slowly diminishing and that a given quantity of radium can produce only a limited total amount of heat energy, which is, however, about a million times as great as that formed by the burning of an equal weight of coal. The chemical and physiological activities of radium are also matters of great interest and importance.

The rays or radiations of radium are of three sorts, the "alpha," the "beta" and the "gamma" rays. The latter are nearly identical with X-rays, the beta rays are electrons or particles of negative electricity shot out at velocities of over 100,000 miles a second. The alpha rays are material particles, also shot out at nearly as great velocities as the beta rays. The identification of the alpha rays as atoms of the gaseous element helium was one of the great discoveries that went far to explain the mystery of radium. In addition to helium, radium also produces continuously another gas, the emanation, which like radium itself is intensely radioactive. Now both helium and the emanation are material substances, each of which is an element, and the change of radium into these gases is, from the chemical standpoint, quite as marvelous as that of silver into gold would be. But this is only a part of the story: radium itself is being continuously produced by the element uranium, and the final product of the emanation is very probably the metallic element lead.

Any adequate theory in explanation of the phenomena of radioactivity must naturally be based on an assumption regarding the nature of matter and the structure of the atoms. It has long been evident that we cannot consider the atoms to be solid, indivisible particles. It is now thought that an atom is made up of electrons and helium particles moving in concentric circles with enormous velocities, and that the atoms of one element differ from those of another element only in the number and arrangement of their component parts. Such an atomic system would usually be stable, as in case of elements not radioactive. But if it were not wholly stable, it would in time break up and in so doing throw out electrons or helium atoms with high velocities.

According to this theory, the energy of radium has existed in the atom as the energy of its rapidly revolving parts, but becomes apparent only when the atom disintegrates. Radium seemed to have a constant activity merely because it was changing very slowly—about .04 per cent a year: it is, therefore, not a source of perpetual energy. The change of one radioactive element into another and into helium is accounted for in the following simple fashion: the larger, heavier parent atom disintegrates, shooting out an electron, or an alpha ray, which is an atom of helium, and leaving a smaller atom of a new element, which becomes in the course of time unstable and in its turn disintegrates, this process continuing until a stable atom of lead is finally left.

It is now proved beyond doubt that radioactive change is spontaneous and cannot be induced or influenced by any human agency; the chemist is still unable to produce the transmutation of a single element into any other.



CULEBRA "VOLCANO" CHEMICAL ACTION IN SOIL



Burning ground in the Culebra Cut of the Panama Canal, a phenomenon which gave rise to the report of a developing volcano, is due simply to the unusual chemical action in the soil bared to the sun and rains.

Blue smoke issues from vents in the mass, fragments of wood are charred and consumed, and small amounts of steam are detected. Scientific investigation shows the phenomenon to be due to the oxidation of pyrite in the soil, sulphuric acid and sulphates of calcium, aluminum and magnesium being present.

LIGHTHOUSE TOWER AS "TITANIC" MEMORIAL

The new Sailors' Home Building, at the corner of South Street and Coenties Slip, New York, will have a lighthouse tower designed as a memorial to the "Titanic." This tower, according to the Nautical Gazette, will be identical with the accepted form of lighthouse, with stairs in the rear, a lantern gallery, and a fixed green light which will shine out over the harbor and be visible to all the lower anchorage down through The Narrows to Sandy Hook. The government has given permission for the use of the green light, and, as this color is not used by any lighthouse on the coast, the memorial-tower lantern will be a particularly distinctive one.

CONCRETE-BLOCK OUTFIT FOR BOYS

Nothing delights the average boy more than the building of something real, whether it be a playhouse, a boat, a cart, or any other object which a wide-awake boy can fashion with varying degrees of success. No material, however, is more suited to arouse the interest of the boy and convert his desire to "do things" into practical, tangible results than concrete, and, provided with an outfit similar to the one dealt with in this article, he will be able to plan and build numberless small structures, such as miniature houses, dog kennels, etc., and also construct such articles as retainers for garbage cans, match safes, flower boxes and many other useful things.

The outfit for making concrete blocks consists of a frame, 2 by 2 by 2 in. or

2 by 2 by 4 in., with plates sufficient to make four different block faces for the full-sized blocks, and eight faces for the smaller blocks; an adjustable mold for making copings, cornices, door and window sills, and any other special blocks up to 2 by 2½ by 10½ in., together with cores for making the blocks hollow. Triangle strips are provided for making bevel edges, and there is a full equipment of tools for keeping the molds in good condition, as well as complete instructions for making concrete, tamping and coring the blocks, setting up the molds, and making special blocks and columns.



A Memorial to the "Titanic," the Lighthouse Tower of the New Sailors' Home in New York

SEA CRABS AS TRAVELERS

The propensity of edible sea crabs to travel has been undergoing interesting tests in England. Between July and September, 1910, according to a report of the Eastern Sea Fisheries Committee of London, Eng., nearly 2,000 crabs were captured, and, after being labeled, were again set free along the Norfolk and Lincolnshire coasts. These crabs had cast their shells a short time before cap-

ture and new ones were in the process of hardening when they were labeled. The crabs were returned to the sea at varying distances from the shore; rewards were offered for their return when captured, and up to the present time about 21 per cent have been turned in to the commission by fishermen, and full data tabulated. One of the crabs had traveled a distance of 98 miles, several had journeyed from 40 to 50 miles, 52 were captured within one mile of their first home, and 300 had traveled only three or four miles.



Open-Air School for Weak Children Conducted in a London Bandstand

OPEN-AIR SCHOOL IN BANDSTAND

One of the bandstands in Regents Park, London, is now being used as an open-air school for weak children, through the efforts of Dr. Sutherland, of the Marylebone Dispensary. The children attend this school in all kinds of weather, being provided with shawls and foot covering in wet weather. The bandstand is an ideal place for such a school, and the sessions, holding during the day and on week days only, do not interfere with the use of the stand for band concerts.

That safety first is becoming an important factor in railroad operation is shown by the recent statistical report of one of the largest railway systems in the country, which carried, during the five years previous to December 31, 1911, 151,802,143 passengers, of which only three were killed.

ECONOMY OF GASOLINE POWER FOR TUGS

By converting the tug "Fox" from steam to gasoline-motor power, the owners of this Pacific Coast boat have succeeded in saving the wages of an engineer and have obtained a number of other advantages. It was necessary to take off the old house and then build a new bed for the engine, but the new arrangement gave much more room for quarters. The reduction in weight of power plant brought the tug about 8 in. higher out of the water, which was a decided advantage, as the absorption of water in her woodwork had carried her down 10 in. below the waterline originally planned, and more freeboard was needed for her class of work. The new engines increased her speed almost two miles an hour, and are being controlled by the pilot in the pilot house, with occasional attention from the one deck hand.



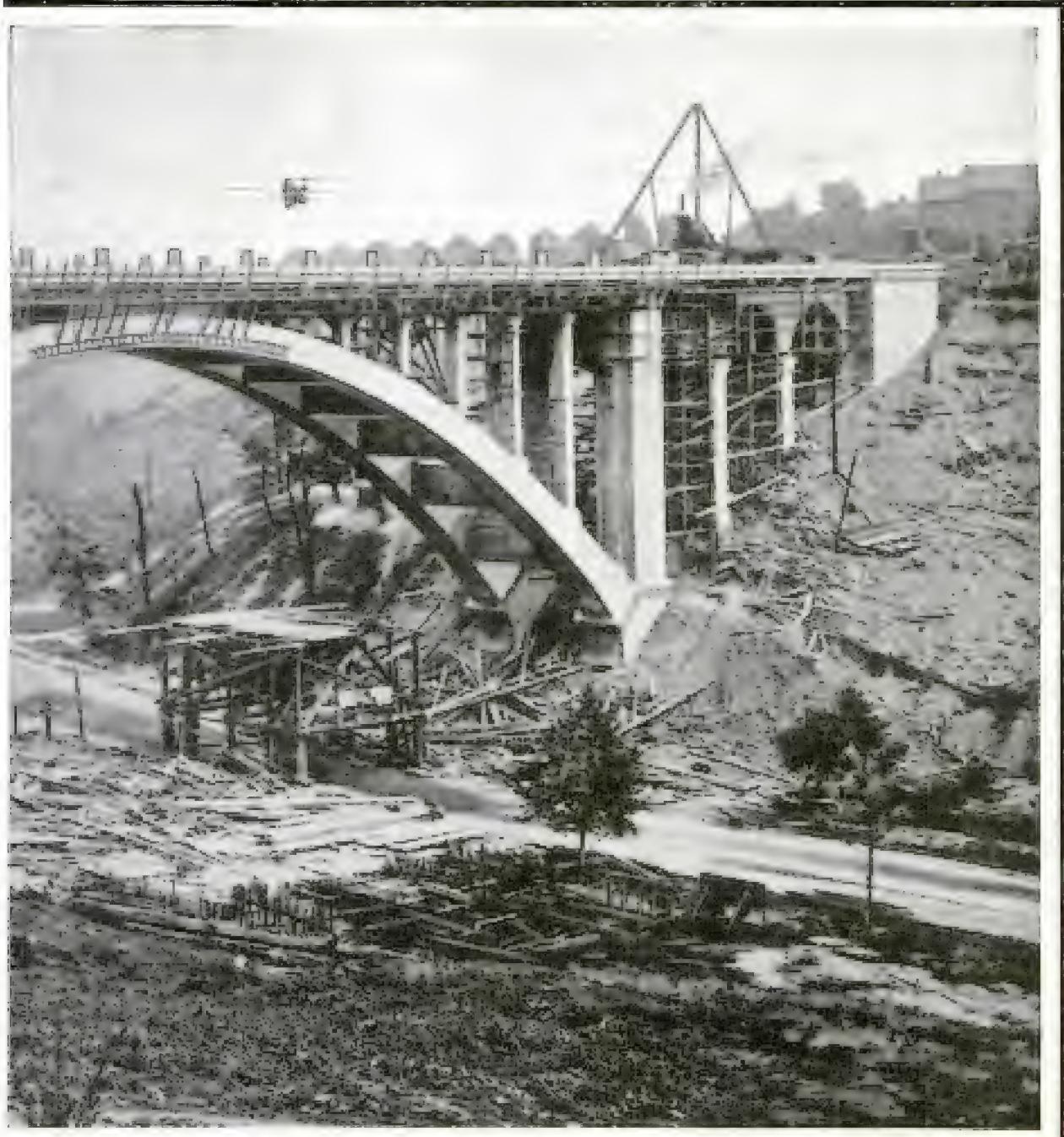
Mammoth Reinforced Concrete Arch in New Pittsburgh Bridge of

GREAT ARCH OF CONCRETE IN PITTSBURGH

The largest concrete arch in magnitude in the world, and the second largest as respects length of span, is practically completed at Pittsburgh, Pa. It forms part of the Larimer Avenue bridge over a deep ravine in the eastern residential section of the city, and measures 312 ft. clear span. In Australia, 12,000 miles away, there is a

huge arch of concrete with a clear span of 317 ft.; but as it is 36 ft. wide as compared with the 50 ft. width of the Larimer Avenue bridge, the American work is by far the largest. The height of the Pittsburgh structure is 113 ft.

Overall, the bridge is 670 ft. with a roadway in the center, 30 ft. in width, flanked by sidewalks 10 ft. wide. The immense arch ribs of the main span have a rise of 67 ft. With the exception of these ribs, which are reinforced



Greater Magnitude Than Any Similar Structure in the World

with structural shapes, the entire work is of reinforced construction, medium open-hearth steel rods being used. The roadway is supported on a main arch by means of columns spaced 17 ft. apart and connected at the top by reinforced concrete girders. The main piers are of cellular or boxlike construction.

At the western end of the bridge are four approach arches and at the eastern end, three; with 30-ft. spans for

alt. Immediately beyond these are the abutments which are of most solid and substantial build, in U-form, filled with earth.

The roadway is paved with sheet asphalt and has a grade of $1\frac{1}{2}$ per cent. There is an ornamental bridge rail of iron, supported by panel posts of concrete, spaced 16 ft., center to center. Ornamental iron electroliers carry arc lights.

In the entire bridge there are 8,500

cu. yd. of concrete and 436 tons of steel. The estimated cost of the work is \$140,000.

Concrete bridges are taking the place of iron and steel bridges all over the country as they are more durable, being less subject to atmospheric influences. No less than three concrete bridges are now being built in Pittsburgh by the municipality. The Larimer Avenue work is under the supervision of the Department of Public Works of Pittsburgh.

IMPROVED AIR CONDITIONS FOR FACTORY

The heating and ventilating equipment of a new factory building in Springfield, Mass., includes two air-cooling machines of the type shown in the accompanying illustration. During very hot weather a simple change of air would not be of advantage, the outside air being of such high temperature that it would offer no relief to draw it into the building. When such conditions prevail it is intended to close all windows, bring the fresh air in through two stair wells and cool this air before it enters the workrooms.

The cooling machines are of the water-spray type. The air is taken in

through an opening in the pent house, enters the cooling machine, is drawn through the water spray, passes a number of baffle plates, where it loses its free moisture, continues through the fan into the stair well and passes from there through the louvers into the workrooms. After it has circulated through a workroom it leaves through the upper louvers in the center partitions and is drawn into the main stair well and exhausted.

The water for the machine is taken from the well at a rate of about 60 gal. per minute for each machine and at a temperature of about 54 deg. F. The manufacturers guarantee that air entering at 95 deg. F. and containing 9.3 grains of moisture to the cubic foot will be cooled to 78 deg.

It is calculated that under these conditions it will be possible to keep the temperature inside the building about 9 deg. lower than the outside, changing the air four times an hour.

As this is practically the first attempt that has been made to cool large workrooms with a view to improving conditions for workmen during hot weather, it is expected that some complications may arise that will make the problem more difficult than it appears, but it is also believed these difficulties will be overcome.

REMOVING PLANT PESTS OF LOUISIANA WATERWAYS

Water hyacinth, the pest of the bayous and canals of southern Louisiana, has become such an obstruction to traffic in those waterways that an organized effort is now being made to eradicate it. At the head of the movement is Lieut.-Col. Lansing H. Beach who will have the active coöperation of officials from various counties, and of local business men. Patrols will be established on each stream. The United States engineering office will do the heavy work of removing the hyacinths, either by spraying or total removal from the water, and will also remove underbrush and trees along the banks where the plant lodges and finds



This Machine Supplies Fresh, Cool Air to a Factory during the Hottest Weather

growth. Fixed and swinging booms also will be established, most of them under government supervision.

After a stream has been cleared the committee will appoint patrols to detach any large masses of hyacinths which may be found, so that they may float seaward. The booms also will be inspected by the patrols. It is believed a man in a skiff can patrol from 5 to 10 miles a day, and a launch patrolman from 10 to 20 miles.

THE WORLD'S GREATEST OIL WELL

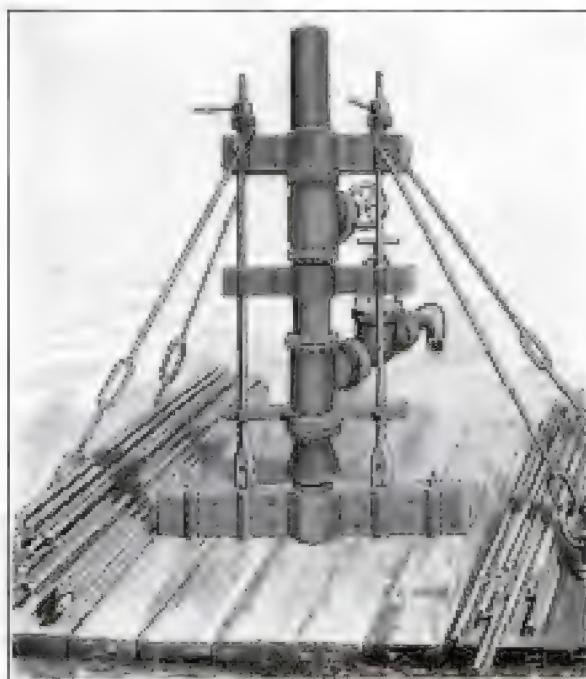
Potrero del Llano, Mexico, claims the biggest oil well in the world. It is situated near the Gulf of Mexico, about 110 miles southeast of the port of Tampico, and was struck at a depth of about 1,800 ft. When the column of oil burst forth it resisted all efforts to bring it under control, running wild for three months before the mechanical ingenuity of experts succeeded in curbing it. This was accomplished by means of a giant steel valve, made especially for the purpose. The valve, which will withstand a pressure of 2,400 lb. to the square inch, was in-



A Mexican Oil Well Which Has a Capacity of 100,000 Barrels per Day

stalled under extreme difficulties, and even with such a valve upon the mouth of the well it was not deemed wise to close the flow entirely at any time. It is throttled to a daily output of about 25,000 bbl.

Several months after the well was harnessed it was opened up to its full capacity to discover whether the flow had decreased. It was permitted to gush forth for 20 minutes, during which time the output was carefully measured and found to be at the rate of 110,000 bbl. per day. More than 10,000,000 bbl. of oil was lost during the period the well ran wild.



Steel Valve on the Mexican Oil Well Which Withstands Pressure of 2,400 Lb. to the Square Inch

Final legal recognition of the aeroplane seems to have come in France, where a law has been enacted providing that a report must be made within 24 hours to the Health Department of births occurring in flying machines.

SHIELDS AS PROTECTION FOR POLICEMEN

The riots in Liverpool, Eng., last year, in which the police received many severe injuries from bombardments of



Shield in Position to Protect the Face Warding off Missiles Hailed from Roofs Method of Carrying the Shield

broken bottles, iron fragments and brickbats thrown by the disorderly element, have resulted in the adoption by the police of that city of a shield for use in such emergencies. It is the invention of a Liverpool citizen, who acted as a special constable during the riots.

PROTECTING CONCRETE AGAINST FROST

A concrete reservoir, 45 ft. in diameter and 21 ft. high, partly above and partly below ground, erected in Virginia, Minn., by the Electric Power & Water Co., was successfully protected against freezing by covering the exposed part with a layer of clay, then a layer of cinders and above that a second layer of clay. When this covering was removed last spring, the tank showed no sign of injury by frost, despite the severe winter.

SULPHUR GASES DESTROYED BY NEW PROCESS

Elimination of sulphur gases from smelter fumes has been accomplished at an experimental plant in California.

Its operation is based on a process originated by Prof. S. W. Young, of Leland Stanford university. The smelter fumes, at properly elevated temperature, are caused to mix thoroughly with the vapor from an oil spray. This process reduces the sulphur oxides to elementary sulphur, which, however, has to be condensed to the plastic or solid form by a reduction in temperature.

The temporary plant comprised a brick flue with a condensing chamber and a second flue leading to a smokestack. The larger flue, which receives the smelter gases directly from the roasters, has transverse panels of brick

checkerwork, the openings of which are filled with broken pieces of a mixture of plaster of paris and sawdust. The sawdust burns out, leaving the plaster porous, and this furnishes a contact material to expedite the reaction between vaporized oil and sulphur oxides. The condensing chamber has a single-partition baffle wall and discharges to the second and smaller flue leading into the stack.

Before the gases are sent through, the whole apparatus is heated to a low red heat. Oil is sprayed into the hot gases near the roaster intake, and water is sprayed through the roof of the condensing chamber. It is reported that by the time the gases have reached the condensing chamber there are no appreciable quantities of the sulphur oxide. Contact with the cooling spray causes the sulphur to condense, most of it being deposited in plastic form on the floors of the condensing chamber,

but considerable quantities are carried out of the smokestack in the form of fine "flower of sulphur." The process is patented.

PRIMITIVE SCREWS STILL USED IN INDIA

Screws are still made in India in the primitive way, according to Eastern Engineering, there being not the slightest change from the original method. Two soft wires are wound together around a mandrel, then the wires are carefully separated, and one of them is soldered into a tube or nut, while the other is soldered to a short rod. These screws are left-hand, as the wire is wound over and over by the right hand. All the silversmiths make their screws in this way.

MECHANICAL PEN FOR STIPPLING

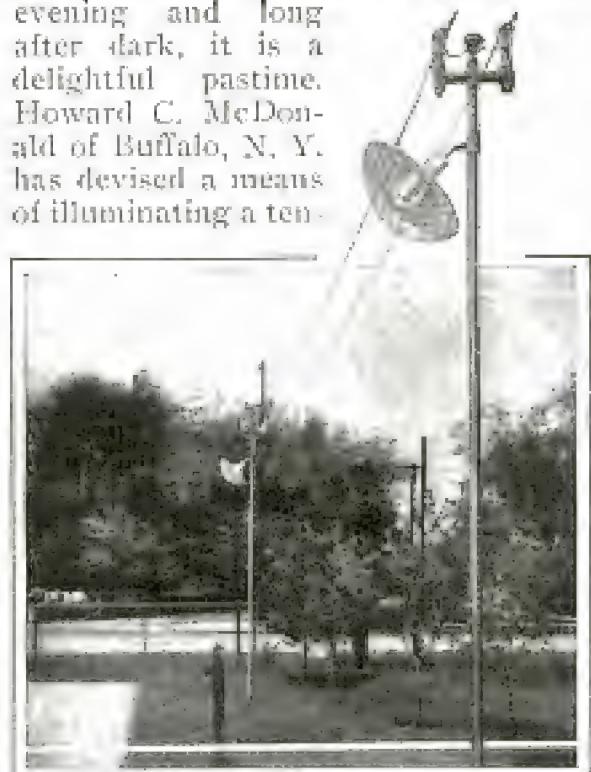
A well-known English artist and designer is here shown at work with an ingenious machine of his own invention to make the series of dots and marks in drawing and engraving called stippling. It is a mechanical pen capable of producing beautiful examples of stipple and other designs, and is run by clockwork. All he has to do is to guide the pen and use his artistic ability as a designer.



Working with a Clockwork-Driven Stippling Pen

LAWN TENNIS PLAYED AT NIGHT

Lawn tennis is a fascinating and healthful game, even when played in the heat of the day, but when it can be played out of doors in the cool of the evening and long after dark, it is a delightful pastime. Howard C. McDonald of Buffalo, N. Y., has devised a means of illuminating a ten-



Lawn-Tennis Court, Showing How Light is Supplied
his court so that play can be started rather than stopped at the arrival of dusk.

The idea of playing tennis with the use of artificial light is not a new one. The former method, described in this magazine some time ago, called for a number of incandescent lights along the four sides of the court, but no effective and economical means of lighting had been devised heretofore.

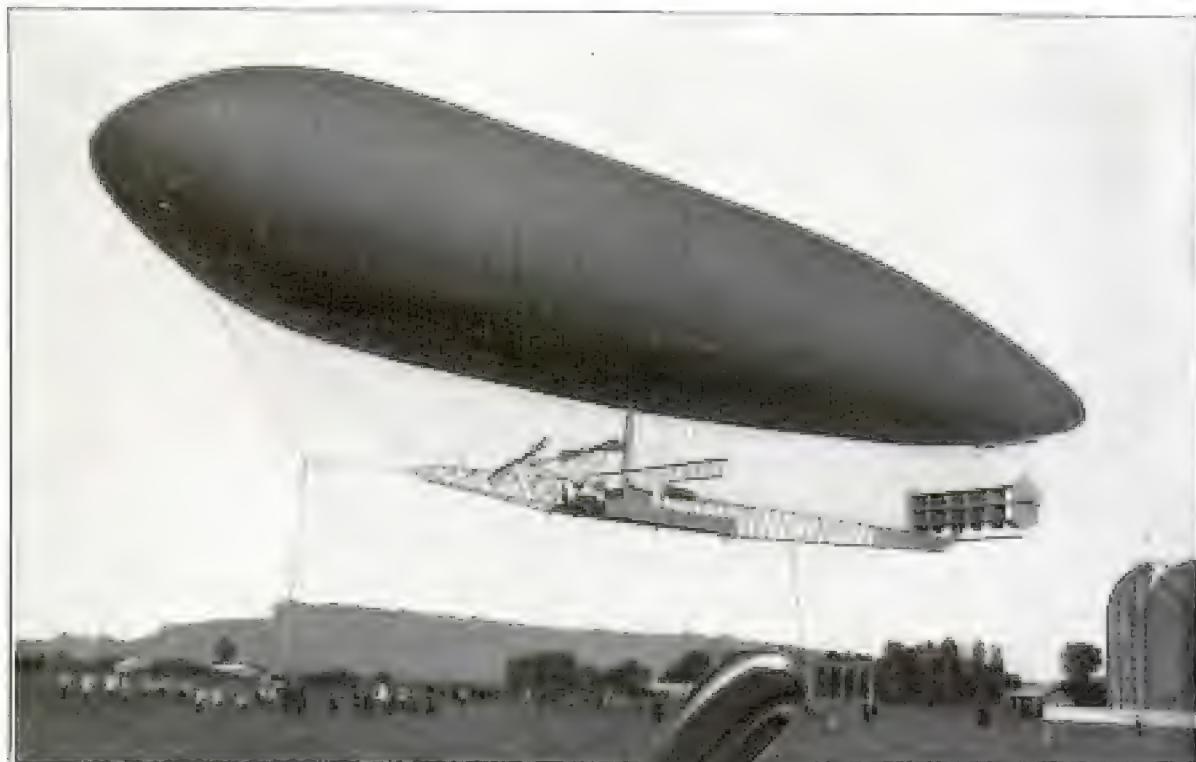
Instead of employing a great many lights and great electric power, the owner can get satisfactory results with four large incandescent lights. The lights are placed at the top of four poles, located 7 ft. back from the side lines of the courts on the sides, and directly opposite the serving line, or 18 ft. on either side of the net.

The poles are 12 ft. high and the lights are set deep in 1-ft. metal reflectors. The reflectors are covered

with wire netting so that they will not be broken by the ball while in play and are tilted at an angle of 45 deg. toward the center of the court. The player thus sees only the diffused light from the reflectors instead of getting the sharp light from the bulb.

The lighting of the court is controlled by a switch from the house. The poles on which the lights are located are of 1½-in. pipe. The wiring is carried along the sides and not across the court, from pole to pole, so that it in no way interferes with the play.

LATEST WAR DIRIGIBLE OF THE FRENCH ARMY



"Clement Bayard V," Latest

The aerial department of the French army, which has been steadily developing the dirigible balloon as well as the aeroplane, and has easily ranked France with Germany as a world power giving most consideration to the gas-lifted airship, has just added the "Clement Bayard V" to its aerial fleet. The new dirigible

French Army Dirigible

is 282 ft. long, has a volume of 318,000 cu. ft., and is driven by two 125-hp. motors. She has two propellers, each of which has a span of about 20 ft., and her speed is about 35 miles an hour.



Carrying Portion of the Car, Showing One of the Propellers and the Motor Arrangement

The Peruvian government has announced the finding of a valuable emerald mine in that country.

INTERNATIONAL RADIUM STANDARD

A commission of scientists from all countries has been working out in Paris an international standard of radium, by means of which it will be possible in the future to exactly determine the quantity of radium contained in any preparation, and consequently also the comparative value of the various radioactive substances.

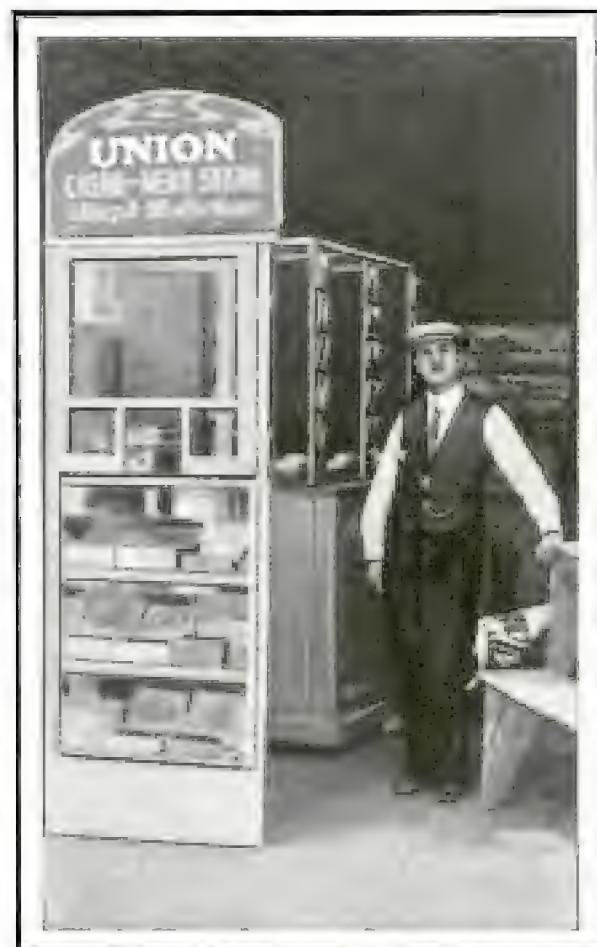
The proposal of Madame Curie, who has taken part in the deliberations, was to adopt as the international standard one which she had previously presented to the Austrian radium institute and a duplicate of which she had presented to Sir William Ramsay. This proposal was accepted.

The international standard will be kept at Paris. It consists of less than eight ten-thousandths of an ounce of pure chloride of radium, to the value of \$2,640. This sum was contributed by one of the members of the commission. Secondary standards will be made and placed at the disposal of governments or scientific institutions, desirous of procuring them.

THE WORLD'S SMALLEST BUSINESS "BUILDING"

What is believed to be the smallest business "building" in the world is located at 2 Light Street, Baltimore, Md. This building, for it is a building inasmuch as a building permit was required from the city authorities before it could be erected, stands on a triangular-shaped lot, has a frontage of 2 ft. 7 in., a depth of 1 ft. 5 in., and is 6 ft. tall.

The ground upon which it stands is a remnant left when Light Street was widened following the great fire of 1904. At that time the city bought all of the lots fronting on this street, as it was then, took what land was necessary for the reconstructed street, and sold the remnants at public auction. The remnant upon which the smallest "building" stands was purchased by Joseph P. Jarboe, who, fortunately, in common with adjacent owners, enjoys



A 2½ by 1½-Ft. Structure, Considered as a Building Because a Building Permit was Required for Its Erection

the privilege of using a portion of the area way in the rear. Otherwise his "property" would be of little use to him.

AUTOMOBILE SALESMEN HAVE FARM-HAND AIDS

The greatest trouble of the automobile salesman whose activities take him among the farmers, is the latter's unwillingness to listen to him during the busy season, but one selling organization, at least, has overcome this difficulty in a very ingenious way. Each salesman takes along with him an able-bodied farm hand. When the farmer mutters "Too busy!" and makes a move as if to start off behind his plow, the salesman checkmates him with, "That's all right. Here's a man who'll engineer the plow while I show you the machine. We'll go for a nice little ride."

SPEED TRIALS OF THE U. S. S. "ARKANSAS"

The accompanying illustration shows the "Arkansas," the greatest American battleship yet in commission, during one of her speed trials off Rockland, Me. Despite her accident in striking a reef, she continued her speed tests, and in five of her fastest runs averaged 31½ knots (34.75 miles an hour). At no time during these runs did she draw on her reserve power.

NEW CIVILIAN COURT DRESS OF BRITISH COURT

New rules on the old and the new style of court dress permitted the ordinary civilian at British court functions have just been published in a book by a court official. Both uniforms are of black velvet, but the older dress is more elaborately ornamented with steel buttons, and there are lace frills and ruffles at the neck and wrists.

Mistakes frequently arise when attempts are made to introduce some of the ornaments of the old style into the simpler form of the new. Persons in uniform sometimes come to court wearing trousers prescribed for a levee, says a writer in the London Mail. They are not always refused entree, but are occasionally permitted to pass the official censor upon promise to keep in the background. Many civilians also make the error of wearing their swords on the right-hand side.

The court dress of a private gentleman costs from \$150 to \$250, according to the elaboration of the steel work in the buttons and sword hilt. The black velvet coat costs about \$50, the steel buttons from \$10 to \$50, and the black velvet breeches from \$30 to \$35. The white satin waistcoat required varies in price from \$10 to \$15 or more, while the cocked hat is a trifle more expensive. Knee and shoe buckles range from \$5 to \$20, and the sword from \$17.50 upward.

Members of the royal household require about \$1,500 worth of uniforms. They must have full dress for courts, state balls, concerts and other great ceremonies, levee dress for less formal occasions, and special evening dress of blue cloth with black velvet collar. For certain officers of the household a Windsor uniform is essential. This is



The U. S. S. "Arkansas," the
When a

an evening dress worn only at Windsor castle.

Cabobe is a beautiful tree which grows in Africa and in the West Indies, and is said to furnish the most costly wood in the world, being quoted at about \$3,500 per cubic yard.



Newest and Most Powerful Battleship of the United States Navy, on Her Recent Trial Trip
Speed of 24.75 Miles was Attained without Drawing on Reserve Power

HARVESTING CAVIARE IN RUSSIA

The delicacy caviare consists of sturgeon eggs or roe, salted down. The caviare industry is most extensive in Russia, and the chief center for the sturgeon fishery in that country is

Astrakhan, at the mouth of the Volga River. The sturgeon often attains a length of 24 ft. and a weight of 1,200 lb., and sometimes a third of this weight consists of roe, a single fish in many instances containing as many as 3,000,000 eggs.

The roe is taken from the fish by

slitting them up the belly on the docks or in the fish houses. Then it is separated from its adherent tissue, passed



Courtesy Illustrated London News

The Source of Caviare is the Sturgeon's Belly; Removing the Eggs or Roe from Sturgeon on a Fishing Wharf in Russia

through sieves, salted down in tubs, and packed for storage or export.

Some years ago the sturgeon fishery was carried on to a considerable extent in Lake Huron and one or two other of the Great Lakes of America, but the catch of sturgeon has been steadily diminishing.

SKYSCRAPERS AS VENTILATING SHAFTS

The inrush of air that takes place when the street door to a skyscraper is opened on a cold day is an annoyance often commented on. But few persons stop to consider the cause of this phenomenon, or to note that it does not occur in warm weather or when the door to a small building is opened.

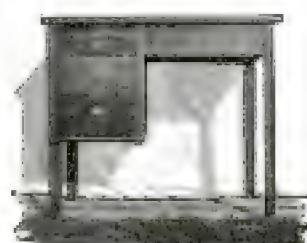
This rush of air is most severe in the highest buildings, which also have the largest elevator equipment. There are always a sufficient number of openings near the top of such a building to cause the elevator shafts to act as huge ventilating flues. The difference in temperature between the air inside the building and that on the outside causes a constant pressure on the doors, the effect of which is noticed only when the doors are opened. To overcome this, two sets of doors are being installed at the entrances to most new high buildings. This is an effective remedy except when the inner and outer doors of an entrance are opened at the same time.

EFFECT OF SOLAR ECLIPSE ON WIRELESS

Interesting tests were made between the wireless stations at the Royal Dock Yard, Copenhagen, and at Blaavands-huk, Jutland, during the recent solar eclipse, to ascertain the effect of the eclipse on wireless transmission. It was shown that the transmission became more distinct and reliable as the eclipse progressed, and that it was most distinct shortly after the culmination of the eclipse. This is claimed to confirm the belief that it is the effect of the solar light upon the atmosphere which causes wireless communications to be less clear during the day than at night.

TABLE CONSTRUCTED BY BLIND WOODWORKER

In the accompanying illustration is shown a combination cabinet and art table constructed for an artist by W. L. Kohler, a blind woodworker. Every part of the table is handmade, finished in dark golden oak, and is only one of the many articles of furniture he is able to construct, though handicapped by loss of sight.





The Only Lodge Hall Located in a Modern Hotel in America

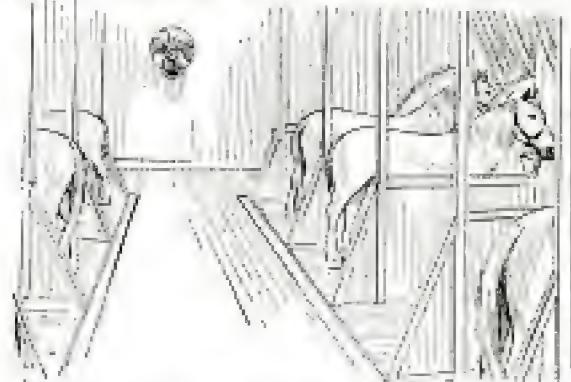
MASONIC HALL IN CHICAGO HOTEL

The beautiful Masonic Hall in the Auditorium Hotel, Chicago, is said to be the only lodge hall located within a modern hotel in the United States. It occupies the Egyptian room, formerly a banquet hall, 85 ft. long by 40 ft. wide, with a 22-ft. ceiling. The main feature of the illumination of the hall is the 21 indirect-lighting fixtures suspended from the 21 stucco panels of the ceiling. Eighteen art-glass windows presented a problem in illumination which was solved by placing indirect-lighting units behind each, at the proper angle to make the art-glass patterns become distinctly visible when the other lights are dimmed.

CA recent test of the gates installed in a Gatun lock of the Panama Canal shows that the operating machinery could open and close the enormous structure, each half of which weighs 448 tons, in less than two minutes.

ELECTRIC FANS USED IN STABLE

The stables in the fine modern barn of the Western News Company in Chicago have been made a paradise for horses during the warm summer months by the installation of electric fans. Oscillating fans are mounted on the wall at the ends of the passageways leading between the rows of



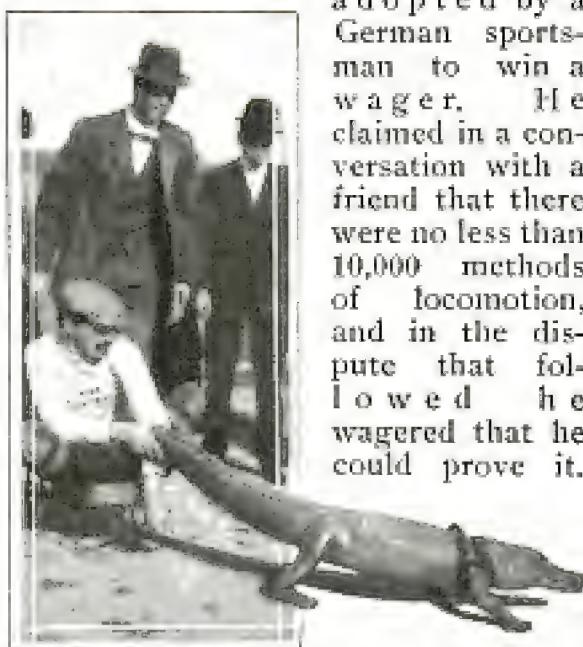
An Electric Fan Keeps the Stable Cool during Hot Summer Nights

stalls, and the movement of air which results keeps the stables comparatively cool.

DRIVING AN ALLIGATOR

Using a child's toy wagon and allowing himself to be drawn about by an alligator, is one of the queer methods adopted by a German sportsman to win a wager.

He claimed in a conversation with a friend that there were no less than 10,000 methods of locomotion, and in the dispute that followed he wagered that he could prove it.



One of 10,000 Modes of Transportation

The bet was taken up by the friend and a trip around the world was undertaken to try out all the various kinds of transportation, and incidentally to devise some new ones. This is one of the German's original stunts. It was carried out at the alligator farm at Los Angeles, Cal. As a photograph of each method of transportation is taken, there will be no question over the result of the attempt.

OZONIZED AIR HASTENS DRYING OF PAINT

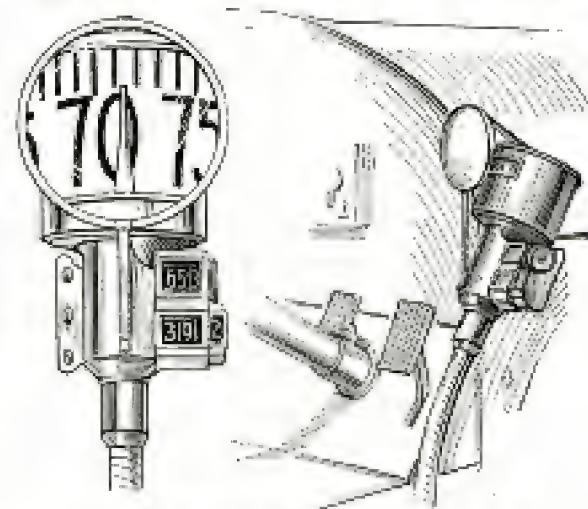
A method of hastening the drying of freshly applied paint, especially on automobile bodies, by means of ozone, has recently been put to a test. The inventor explains that when a filler, paint or varnish dries, a chemical reaction takes place, the oil in the paint becoming oxidized and increasing in weight, which increase indicates the degree of dryness the paint has attained.

The ozone, which is an active oxidizing agent, was carried by forced draft

into the drying room where it came into contact with "green" paint on a newly painted body selected for the test. Another body, having an equal amount of paint spread over the same area, was placed in a natural atmosphere. At the end of an hour the body kept in the ozonized air had gained 1.67 per cent in weight, while the other had increased only 1.13 per cent. At the end of the second hour the respective increases in weight were 3.34 per cent and 1.51 per cent; and after 15 hours the ozone-treated sample had gained 19.74 per cent, as against a total increase of 9.76 per cent for the other. The ozone treatment thus showed an advantage of more than 100 per cent over plain-air drying. Allowing only 50 per cent in practice, the value of the new process is obvious.

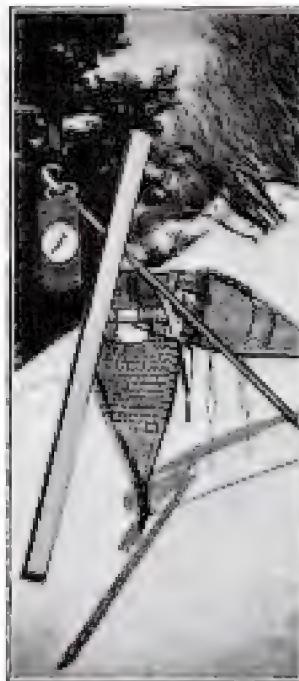
SPEEDOMETER EQUIPPED WITH MAGNIFIER

Several makes of European racing cars are now being fitted with what might be termed "magnifying" speedometers; that is, a magnifying glass of such focus and so placed in relation to the speedometer, that the latter may be easily and distinctly read from the driver's seat. It is claimed that the device brings the speedometer figures into



A Special Magnifying Speedometer Designed for Use on Racing Automobiles

full view without in the slightest degree diverting the driver's attention from the road.



Outfit of Weather-Bureau Agent for Measuring Winter's Snowfall

are made in the great canyons and gulches just before the early spring planting season. Measurements of depth and density of the snow layer and its approximate area are computed by the Weather Bureau experts and a determination reached as to the season's water supply for irrigation and water power.

The irrigating farmer may ask: "How much water will I have this season?" He is interested in the quantity of water which the mountains will yield, no matter what kind of crop he may plant. His interest, of course, is entirely practical. If he knew just how much water he would have for the coming season, he could tell approximately the value of his crop. The engineer is equally interested in this question. If he were to build a dam either for power

MEASURING A WINTER'S ACCUMULATED SNOW

By L. WILLIAM THAVIS

Measuring the vast annual snowfall in the Rocky Mountains to aid the farmers of the semiarid West in growing their crops more intelligently and profitably, is a new work in which the United States Weather Bureau is now engaged. These surveys

or for irrigating purposes or for both, a knowledge of the average amount of water which may be expected to pass a certain point would be of greatest value to him. And after the dam is built, such knowledge is of no less importance.

To the greater part, the moisture precipitated as rain or snow is evaporated from the surface of the oceans. After evaporation the water vapor is borne along by the general eastward drift of the atmosphere and precipitated according to the well-known laws of rain or snow formation. Snow is deposited on the lower levels in the winter time, but at the higher elevations the first snow occurs in the early fall and continues all winter and spring. At the very highest levels precipitation is in the form of snow even during the summer months.

The snow does not lie in an even layer over the mountain side, but is blown, not only during a snow-storm but by wind-storms at other times as well, into gulches and ravines, forming immense drifts. And it is to the forming of these drifts that we owe our summer



An Example of the Difficulties Encountered by the Field Force



Snow-Filled Valleys in the Rocky Mountains Which Feed the Summer Streams

water supply. This snow becomes packed and solidified in many places to the density of ice. This density is due to the great depth of the drifts, the upper layers bearing down upon those underneath and packing them. As spring and summer approach these vast fields of packed snow begin to melt and yield water for irrigation.

For computing the water equivalent of an area of snow in a watershed above an irrigation dam or canal, the expert uses an outfit, comprising a density tube and scale, an aneroid barometer, a compass, and a metal semicircle with plumb and pointer, to secure slope angles. Besides clothing suitable for work of this character snowshoes are an indispensable part of the outfit.

The density tube is an instrument made of galvanized sheet iron, 3 in. in

diameter and 4 ft. long. It has a projecting iron "nose," resembling a saw edge, to facilitate perforating ice crusts or solidly packed snow. Outside the tube is a scale for measuring depths. The method of operation consists simply in plunging the tube into the snow layer and weighing the instrument with its core of snow. The scale on the balance is so arranged that the depth of water, equivalent to the snow layer, is read off at once. With the aid of other apparatus the total acreage of the watershed is measured.

After the number of acres of snow layer, its depth and density are computed, a determination is readily reached as to the approximate quantity of water that may be expected to be supplied from the mountains in a given territory during the spring and summer seasons.

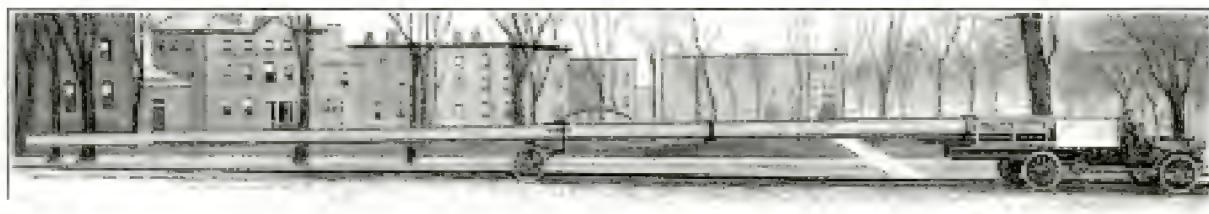
VALUABLE GAMBLING TOOLS IN POLICE BLAZE

The statutes of New York state require that all gambling apparatus con-

fiscated by the police be burned. The Syracuse police, in following out the



Burning Roulette Wheels, Faro Outfits and Other Gambling Paraphernalia Seized by the Syracuse Police



Flagpole, 87 Ft. Long, Transported from Newark to Mendham, N. J., on a Motor Truck

letter of the law, recently destroyed apparatus to the value of about \$8,000. The accompanying illustration shows clearly the bonfire made by the authorities. In the foreground is a large roulette wheel, which alone is worth a considerable sum. Three large vans were necessary to carry all the appliances to the dump.

TRANSPORTING BIG POLE ON MOTOR TRUCK

A remarkable feat in motor-truck transportation was successfully carried out recently in the transportation of an 87-ft. main section of a flagpole from

Newark to Mendham, N. J., over a road having a number of steep grades. The section weighed 5 tons.

AEROPLANE MOTOR IN ENDURANCE TEST

In a recent test at the British military aeronautical field, located at Farnborough, Eng., a new 9-cylinder, 110-hp. motor ran 24 consecutive hours without a stop, developing an average of 113 hp. The fuel consumption amounted to 0.1 gal. per hour for each horsepower. The performance of this motor, according to the French journal *L'Aéro*, is without a precedent.

THE GOVERNMENT'S GREAT WIRELESS STATION

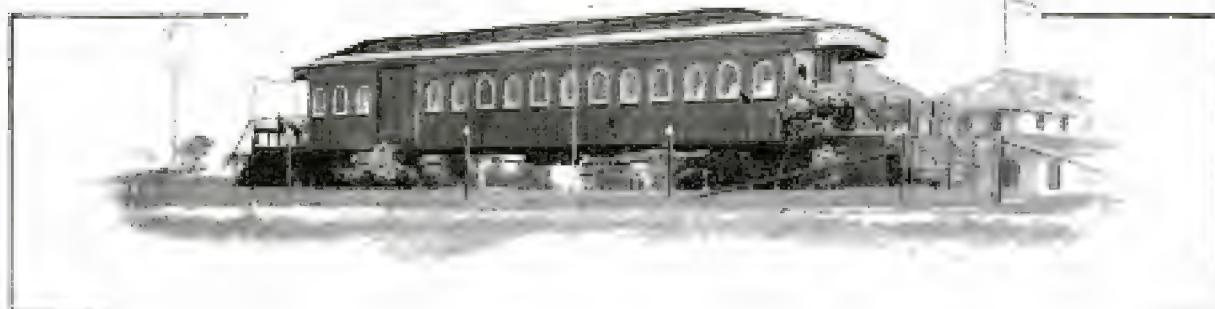
Two of the three great wireless towers being constructed by the government near Fort Myer, Va., are shown under construction in this illustration. These towers will be the central station, and through them, with the aid of the remainder of the system, the government expects to be able to communicate with its battleships and

stations nearly all over the world. The tallest of the three towers will rise to a height of 650 ft., and the two smaller ones will each be 450 ft. high.

The boring of a second Simplon Tunnel, for which the heading was prepared from the first, may be abandoned in favor of a scheme for broadening the gallery of the present tunnel, without interfering in any way with the normal traffic.



The Great Towers of the Government's Central Wireless Station in Course of Construction



Private-Car Cottage Has All the Comforts of Home

OLD RAILWAY COACH USED AS A COTTAGE

Though the private railway coach is regarded as a luxury of the very rich, there is at least one private railway coach, which, while a luxury, is not the property of a millionaire. This particular coach is doing duty as a summer cottage for a railroad man and is said to be a most comfortable home. It long ago ceased to travel on the rails and while still retaining its

distinctive form, is also, literally, a vine-clad cottage. The man who lives in this house secured an old Pullman coach when he first conceived the idea. He had the old car placed on an unused siding, remodeled the interior into a bedroom, dining room and kitchen, erected porches at each end, planted a few flowers and vines and painted the sides of the car.

DIVORCED BY A FOOT

Divorce is an old institution in China and the use of finger and even foot prints, as identification marks, is as

AND HAND SIGNATURE

ancient, perhaps, as Chinese history. No court procedure is necessary for obtaining a divorce, only the consent of the families concerned. In the accompanying illustration is shown part of a divorce agreement signed by the imprint of a hand and a foot. The document reads in the following quaint manner:

"The writer of this divorce agreement, Hing Hing Wang, had once, at Sinnethoang, taken for wife the sister of Liou Lao Wei. Now when my family is as poor as if it had just been washed, there is not enough food and clothing. I can no longer support my wife. Therefore, in the presence of my wife, Mrs. Liou, I distinctly state that I consent to a divorce, that she can at her will enter another family or seek her own means of living. Let her marry any other man. I shall have no objection. Lest anyone should fear that I keep not my word, I have voluntarily written this document and in witness thereof put upon it the imprint of my foot and of my hand."



Portion of Chinese Divorce Document Signed with Imprints of Both the Hand and the Foot

BUILDING TELEPHONE LINES WITH DYNAMITE

Dynamite promises to become an important aid to builders of telephone and telegraph lines in the future, when the ground is so frozen that the digging of holes for the poles is a difficult and tedious operation. Experiments that have recently been completed show that if pole holes are dug with dynamite, the cost is reduced from \$1.75 to 35 cents per hole and that with ordinary labor, a mile of line can be constructed in this manner in a day. The method of digging the hole is very simple. A small dish-shaped basin, 6 in. deep and about 18 in. wide, is first excavated. With an auger a hole, 2 in. in diameter, is sunk to the desired depth and

a $\frac{1}{2}$ -lb. stick of dynamite is placed at the bottom of the auger hole. When this is fired, the earth will be loosened the full depth of the hole to the diameter of from 18 in. to 2 ft., and is easily removed with a shovel.

Striking View from an Aeroplane

to make moving pictures of the clouds at higher altitudes than have been attained in the past. By means of these pictures it will be possible for the weather experts to make minute examinations and add materially to their present knowledge. Motion pictures have been made of clouds at lower altitudes with excellent results.

FORTIFICATION PLAN SHOWN BY AERIAL PHOTOGRAPH

This striking view of one of the few examples of early fortification construction still remaining practically intact, was taken from an aeroplane. The fort, built about 1550, for the defense of the city of Antibes, is situated on the Mediterranean coast of France, not far from Nice.



The aerial photograph brings out with surprising clearness the geometrical regularity of the structure and its star-shaped plan, and shows the old moat, now dry, and the outworks on the shore of the sea.

STUDY CLOUDS BY MEANS OF MOTION PICTURES

Studying clouds that are 50 to 150 miles above the earth will be done in the near future by means of motion pictures, according to Willis L. Moore, chief of the United States Weather Bureau. Mr. Moore recently attended an international gathering of weather experts in London, and, in an address, declared that he believed it to be possible, and intimated he would attempt,

Calgot Lange, who is exploring the Amazon River for the University of Pennsylvania, is authority for the statement that savage races can no longer be tempted to part with valuables in exchange for brilliant-colored cloth and beads, and that guns, knives, hammers, axes and other useful articles must be carried in the explorer's pack, if he expects to secure samples of native handicraft in the unexplored regions of the world.

THIRTEENTH HOUSE HAS INVERTED NUMBER

The ownership of a house numbered 13 so worried a London woman that she wrote the city fathers asking per-



Way in Which a London Woman Believes She has Overcome the Bad Luck Clinging to Number 13

mission to number it "12A," and, on being sternly refused, solved the difficulty in the manner shown in the illustration. She had the number plate put on upside down and renamed her house "A 1," placing the name plate immediately under the inverted 13. She was impelled to make such a change, she declares, by a series of minor accidents and annoyances which occurred in the house to members of her family, and which she attributes to the fateful number. Since the new number was affixed, the household has had peace and quiet, and the housewife feels sure her ingenuity is responsible for the banishment of the hoodoo.

SCIENCE TO HELP RAISE INFANT OYSTERS

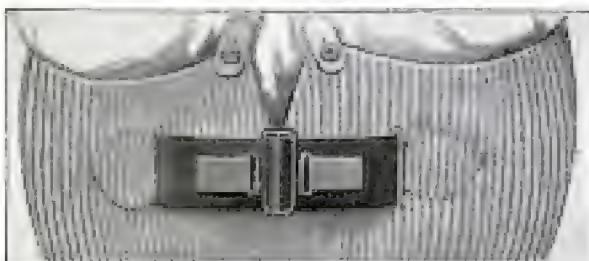
A new sort of commercial "chambermaid" is likely to be called into existence, whose duties will be to "make up beds" for infant oysters, that they may have every opportunity of grow-

ing into mature oysterhood and eventually find their way, in vigorous health, to the stew pan of some discriminating epicure. Dr. Joseph Stafford, of McGill University, has been studying the life and customs of the oyster, and has discovered a way to determine just when the extremely young oyster growths, or spat, are about to settle down to the floor of the ocean or river and start housekeeping.

There has never been a tenement-house commission or back-yard cleaning brigade for those particular sections of the sea or river bottoms where oyster cities are located, and consequently the young were frequently forced to lie on beds of slime, which had the same effect on the growth and development of the infants as the foul air and insanitary surroundings of some cities have upon the growth of children. Oystermen have never before been able to tell just when the settling period of oysters occurs, and consequently many promising families were cut off in the bloom of early youth. By means of Doctor Stafford's discovery, beds can be prepared at the proper time that will be free of slime and contain just the things to make oysters grow fat.

PINLESS SAFETY BUCKLE FOR TROUSERS

Worried for fear that the sharp pins of the strap buckle found at the back of certain makes of trousers might inflict injury on the fingers in the process of tightening or loosening, a French inventor has designed the ar-



The Pinless-Buckle Idea as Adapted to the Back of the Trouser

rangement shown in the drawing; the buckle of which has no sharp pins. The arrangement consists of two

metal fittings having slotted ends, sewn to the trousers as shown. In these slots is inserted a band, one end of which is provided with a sliding buckle, while the other end is firmly

attached to the slot of one of the metal fittings. The sliding buckle has two small straps, one on either side, the pulling of one or the other of which shortens or lengthens the band.

GERMANS LAUNCH THE LARGEST SHIP

The recent launching on the Elbe of the "Imperator," of the Hamburg-American Line, gives Germany the distinction of having the largest ship in the world. She is 900 ft. in length, 96 ft. in width, has a tonnage of 50,000 and a displacement of 72,000 tons, and will be driven at a speed of 22½ knots (25.90 miles an hour) by engines developing 70,000 hp. She has nine decks above the waterline, and will accommodate 4,250 passengers and a crew of 1,000, a total of 5,250 persons.

The "Imperator" is about 20 ft. longer

than the "Olympic" and has a tonnage of about 5,000 more.

The hull is constructed with a double bottom, extending practically the entire length of the ship, and there are seven steel decks within the molded structure. Thirty-six water-tight compartments are provided, the doors necessary for communication in the transverse bulkheads being as limited in number as possible. The Fralim anti-rolling tank system has been adopted to prevent rolling when the vessel is broadside to the sea.



Standing Up Like a Skyscraper: the Bow of the German "Imperator" Just after the Launching

DRIED-APPLE MODEL OF PANAMA CANAL

The prize of \$200 for the best feature exhibit of the last annual apple exhibition of Watsonville, Santa Cruz



Panama Canal Model, 30 Ft. Long by 8 Ft. Wide, Worked Out in Dried Apples by Students of the Watsonville, Cal., High School

County, Cal., was awarded to a model of the Panama Canal worked out in dried apples by the students of the Watsonville high school. The model was 30 ft. long by 8 ft. wide, worked out from a detailed chart. Battleships guard the Atlantic and Pacific entrances of the canal, merchant ships are shown in different parts of the canal, the cities of Panama and Colon are represented by small colored houses, and lighthouses containing tiny incandescent bulbs are located at each entrance.

AN ERASER THAT REMOVES IRON RUST

A simple, but effective eraser for removing rust spots from an iron or steel surface is being marketed in France. To all outward appearance it is like the ordinary ink or lead-pencil eraser, although made in much larger sizes, and consists of a vulcanized composition of rubber and emery powder.

The eraser is particularly useful in removing rust from parts of automobile and aeroplane motors, and the like.

WOODEN TABLECLOTHS IN GERMANY

The German wood-pulp industry has found a new outlet for its material, in the form of household linen. The labor is long, but profitable. Owing to the shortness of the fiber, the wood pulp has to be first made into paper, and then rolled and twisted into thread. From this thread there are manufactured hat bands, carpets, tablecloths, and many other such articles of every-day use. Seventy-five cents worth of wood is thus made to equal \$10 in paper yarn, and \$38 as artificial silk. The system of making artificial silk from wood fiber, introduced in

France many years ago, is now quite a commercial success in several European countries.

CAST-IRON SPIRAL SPRINGS

A cast spring, made of vanadium iron, is shown in a bending test in the accompanying illustration, demonstrating the utility of cast-iron springs made of this metal. The vanadium iron is not only tough, exceedingly



A Cast-Iron Spiral Spring Made from Vanadium Iron
malleable, close-grained and machinable, but has a remarkable elasticity as well. The spring shown can be ex-



Tempering a Sword for Royalty in Japan

panded, compressed and bent through an angle of nearly 180 deg. without breaking. It is about $5\frac{3}{8}$ in. long, and has been expanded to a length of $7\frac{1}{4}$ in., and compressed to $3\frac{1}{4}$ in.

In the first fly-swatting contest of record this season, held in San Antonio, Texas, 3,157,995 flies were killed by the children of the city.

CEREMONIAL SWORD TEMPERING

An interesting scene in the workshop of Massayoshi Morioka, one of the most famous makers of swords in Japan, is shown in the accompanying illustration. It shows the ceremonial tempering of a sword by order of the imperial household.

AN APPEAL TO INVENTORS

By I. G. HOOPER

The law of progress is ever calling on the inventor for new or improved creations. Just as he has mounted "up on wings like the eagle," the call comes for a practical instrument for testing the quality of air, automatic in action, constantly indicating the exact or approximate percentage of oxygen.

Such an instrument would be of inestimable value. A revised pure-air law would inevitably follow, compell-

ing its use in every school, church, hall, factory, hotel, lodging and tenement house, etc., reconstructing all present methods of ventilation, thus abolishing countless ills, and raising the health standard beyond precedent.

The demand for such an innovation is urgent, and must sooner or later attract the attention of some inventor to whom there is no such word as impossible.

LONDON ADOPTS "SOLOMON" MASCOT

The famous "Billikin—God of Good Luck" mascot, which has reigned supreme in the world of mascots for the past few years, has been almost forgotten in London in the enthusiasm for a new mascot known as "Solomon Solomon." This is a quaint little figure represented as quoting Premier Asquith's famous words "Wait and see." Solomon Solomon is claimed to be a marvelous luck bringer, and to endow its possessor with the great wisdom that was Solomon's.



ROOF GARDEN AND GARAGE IN MILLIONAIRE'S HOME

A three-story house that furnishes living quarters for a millionaire and his family, a roof garden, and a garage large enough for five motor cars, is one of the novelties in the building world. The house is being constructed at Milwaukee, Wis., for one of the prominent citizens. The roof garden will be fitted up in lavish style and the garage, which will occupy the greater part of the ground floor, is to be equipped with every appliance for keeping automobiles in condition for constant use. The living quarters of the family will be on the second and third floors.

Brilliant red trousers for European soldiers are doomed to total eclipse, Austria having recently followed the example of France in clothing its troops in more somber garb.

CATCHING FISH WITH A LUMINOUS BAIT

The fishermen of Cezimbra, Portugal, are said to have developed a novel method of attracting fish, in which a yellow fluid pressed out of the abdomen of a fish found in the neighborhood, but rare in other waters, plays an important part. This fluid emits a bluish phosphorescent light in the dark, and the fishermen rub it upon the bait, which is thus made to glow brightly when in the water, attracting the fish.

INGENIOUS COUNTING SCALE

In the manufacturing plant of an American automobile-accessories concern has been installed a specially constructed scale for use in counting small parts. The upper scoop is the unit and the other scoops balance, respectively, at 25, 50 and 100 times the weight contained in the former. By counting out 10, 25 or 50 of the pieces to be counted and placing them in the upper scoop and then filling up one of the other scoops until the scale balances, the number of pieces in the latter may be determined by multiplying the number in the upper scoop by the number marked on the larger scoop. That is, if there are, say, 50 pieces in the unit scoop, the number in the largest scoop, when the scale balances, would be 100 times 50, or 5,000 pieces.



COMMENT AND REVIEW

THE first steamboat, steam locomotive and glider each aroused the derision of the public in their first attempts. Such was the fate of the contestants who entered for the first public competition of motorless flying machines.

The prize was \$2,000, but out of 198 entries only 25 actually competed. The machines were quite similar in construction, being merely bicycles or tricycles fitted with planes and propellers. The motive power was furnished by the rider by means of the pedals. "Aviette" is the name bestowed on this latest device in the art of flying.

Flying Bicycles

To win the prize one had to rise from the ground, if only a few inches, and travel a marked course of 33 feet. A second prize was offered to anyone who flew over two strings placed only four inches apart. All the trials met with failure, the performance being likened to the antics of a lot of cowboys trying to ride bucking bronchos. Some of the inventors were absolutely exhausted after their fruitless efforts to get their machines off the ground, but at no time was any one in peril, unless it was the spectators. L'Aéro, however, treats the matter seriously, and says: "The contest, although a failure, has not proved the impossibility of motorless flight. By displaying before the public machines which lack even common sense, an impression has been created that the problem is more difficult than it really is." Paulhan, who won the \$50,000 prize for the flight from London to Manchester, comments: "None of the competitors understands the problem, and the motorless flying machine does not yet exist." Tissandier is quoted as saying: "They all lack scientific knowledge and their propellers are nearly all feeble. While I think it is possible to fulfil the requirements of the Peugeot prize, I don't think any aviette will be able to fly for many miles." As experiments involve neither personal risk nor great expense, some of our young inventors might find considerable amusement, if not profit, in attempting to work out the problem.



THAT the limit in the building of big ships has not yet been reached or even decided on, is the opinion of the recent International Congress of Navigation. As to what the final extreme length of ships may be no one seemed

Panama Canal Too Small

willing to definitely commit himself. The subject came up during the discussion of a report in which it was recommended that a limitation in size might be secured by refusing government aid to the building or operation of sea-going vessels whose maximum dimensions exceeded, length, 900 feet; breadth, 105 feet; draft, 32.2 feet. At the same time the prediction was made that the time was not far distant when the Panama Canal will be too small to permit the safe passage of the great ships of the future. Naturally the loss of the largest ship afloat was discussed in its bearing on future construction, but the opinion was that that event would serve as no deterrent; that a smaller ship with the same injury would not have remained afloat nearly as long.

On land the tendency is unquestionably toward centralization and large units, with a result of better service and greater economy. The isolated electric plant cannot, ordinarily, compete with the large stations in big

cities. Railroads are building larger locomotives to haul longer trains. Steel buildings that were erected only 10 years ago and which should last a century are being pulled down to be replaced by taller structures. Whether this same tendency will work out equally well when applied to the operation of monster freight carriers at sea is yet a disputed question.



**Titanic
American
Owned**

IT will be news to many of our readers that the "Titanic" was practically owned in this country. Such was the statement of Mr. Ismay, the managing director, when giving his testimony before the British Commission of Inquiry. The White Star Line he named as one of several companies whose aggregate tonnage is nearly one million, and which are known in England as the American Trust. The president of the commission inquired why American-owned ships should be operated by British companies and managers, and was told these boats cannot fly the American flag because not built in the United States. The president asked, "In substance, the 'Titanic' was an American-owned ship?" and Mr. Ismay answered, "That is true."

In view of this fact and that hundreds of the passengers were Americans, our Senate Committee investigation can hardly be termed "ill advised."



**Museum
of
Aviation**

IN nearly all the great museums of the world will be found models of the first railroad locomotive and first steamboat, and in several a series of models of each, showing their progress and evolution down to the powerful machines of today. Inasmuch as the art of flying is doubtless yet in its infancy, the opportunity is afforded some museum to collect and preserve the earlier types of aeroplanes against that future day when the best types of the past few years will, perhaps, appear as crude as the "Rocket." In their beginning the importance of first inventions rarely is considered at full value—usually as of no value whatever. Here is an opportunity for someone to make an endowment which will secure and preserve as many as possible of the original, or, where that cannot be done, models, of the early flying machines, and follow with additions marking the progress of the art. In fifty years such a collection would be beyond price.



**International
Weather
Bureau**

WITH a weather bureau more extensive in all its scope and details than any other in the world, it was fitting that our own chief of service, Prof. Willis L. Moore, should be the leading figure in the recent international congress held in London. The plan is to form an International Weather Bureau, working chiefly through ships at sea. With wireless already in general use this becomes possible, and is so obviously for the equal advantage of every country concerned that it becomes one of the very few things where all benefit without disadvantage to any. The suggested plan includes daily or less frequent reports to either the American or European clearing house, whichever the sending ship is nearest, and the

making up of the forecast, which will be sent out and passed from one ship to another. In this way rough water can be avoided by changing course of larger craft, and small steamers and sailing vessels would often escape injury or even destruction. The co-operation of the several countries interested in the undertaking would furnish one more tie of friendly relationship.



HUMAN nature is evidently pretty much the same everywhere, at least in certain respects. It seems to be a generally fixed condition in rich and poor, civilized and savage, to want to get something for nothing. Learned

*Something
for
Nothing*

men write glowing testimonials and receive a set of books in return; bankers lend the institution's money at good rates and excellent security, and pocket a block of stock at the same time; even an eagle secures its prey as the frightened fish hawk drops the fish it has so patiently worked to capture. Something for nothing. The latest evidence of this is seen in catchy advertisements now appearing in papers in England of a wonderful machine, purchasable for a few shillings, which makes two pounds of butter out of one pound of butter and one pint of milk. This is the same scheme which was worked on this side, and with some success until it was exposed in this magazine. Something for nothing! Two pounds of butter by adding one pound of liquid, chiefly water. As a matter of fact, practically the same result is obtained by using water instead of milk. The deception is based on the well-known ability of butter to absorb its own weight of liquid. The result is bulk, not butter, and the regrettable feature of the fake is that it finds its victims chiefly in those who can least afford to lose their shillings. The something for nothing makes easy victims and fat pocketbooks for swindlers.



LIFEBOATS are "not necessary," "not wise," and "absurd," or at least a sufficient number of them to provide for every passenger—entirely overlooking the crew—is so considered in the judgment of Harold Sanderson, a director of the White Star Line. And this astounding state-

*Lifeboats
"Absurd"*

ment was not made before the "Titanic" went down, but less than 60 days after that disaster. If there have been any doubts as to the necessity of stringent governmental control, they must now fade away before such a policy as this. And the remark was not an accidental word, carelessly dropped in casual conversation as the private opinion of an individual. It was part of the sworn statement of a man testifying before the British investigating board as a director of the White Star Line. But this is not the worst. The same witness went on to relate how, to appease public clamor, the "Olympic" on her first westbound trip after the great disaster did carry sufficient boatingage to provide room for every soul on board, women, children, men and crew. "We started," testified Director Sanderson, "to have a number on board equal to the number of souls the vessel carried, but we saw that was absurd, so we reduced them."

As long as there are boats sufficient to save managing directors while the less fortunate passengers are getting drowned, what matters?

With such a policy as that, now, while tears are yet flowing for the dead, can there be any surprise that the "Titanic" was so miserably equipped. Being questioned a second time whether in the interest of public safety there should be (life) boat accommodation for every passenger and every member of the crew, Mr. Sanderson replied, "In the same interest my answer is that it is not necessary and is not wise."

This announcement cannot but cause a decided shock to American travelers, however complacent our British cousins may be. If there be any "absurdity" in so serious a matter, is it not rather that British freight steamers must carry lifeboats for double the number of men on board; while a passenger ship intrusted with a hundred times as many lives is allowed to leave port equipped to save but a fourth or a third?

It was offered in excuse that "there are certain risks in connection with going to sea, which it is impossible to eliminate, just as there are risks in travelling on land"; and Lord Mersay, president of the commission, seconded Mr. Sanderson with "Quite right, every person who goes to sea, or for that matter walks on land, must accept some risks."

The man in the street has some choice, he can take the other side or use another street or wait until a joy rider has passed; but once on the high seas he is without alternative. He cannot control the disposition of his own dead body or even that of his wife. The captain, whose word is law, can sew him in a sack and dump him overboard. Of course there is risk in going to sea, which is precisely the reason why steamship companies which have so little regard for the safety of their passengers should be compelled to reduce that risk to a minimum. That government has and can exercise such regulation is unquestioned. If for instance an American ship attempted to land its passengers stricken with some terrible plague at a British port, would there be any hesitation in using cannon to prevent such landing, if necessary?

"Lifeboats absurd!" That the "Titanic" could sink was also "absurd"—once. It is the fancied absurdities of life that have made most of its greatest tragedies. As the hundreds of brave victims slowly sank into the icy waters of the North Atlantic we can imagine their last words—

"Lifeboats? How absurd!"

H. H. WINDSOR



UNCLE SAM URGES A STERN WAR ON SPARROWS

By L. T. WILLIAMS

English sparrows are abundant in every town and city in the United States and in many suburban districts. They are noisy, filthy, and destructive. They drive native birds from villages and homesteads. Though they are occasionally valuable as destroyers of noxious insects, all things considered, they do far more harm than good.

Uncle Sam, through his Department of Agriculture, has planned ways and means for the extermination of this pest. His recommendations of practicable methods of dealing with the sparrow include the destruction of nests, trapping and poisoning, urging trapping as unquestionably the best. English sparrows are good to eat, he says, and their use as food is recommended, because of their nutritive value, as a means of reducing their numbers. They have been eaten in the Old World for centuries. In

many of the first-class hotels and cafés of this country the sparrow is served to patrons as a "reed bird." Uncle Sam says the difference in taste is not discernible.

The English sparrow was introduced into America a little more than 60 years ago, and is now distributed in vast numbers over all the United States and Canada. This rapid dissemination is a result of the bird's hardiness, extraordinary fecundity, diversity of food, aggressive disposition and almost complete immunity from natural enemies.

On the farm and in the city the sparrow is a notorious pest. It destroys fruit, as cherries, grapes, pears, and

peaches. It also destroys buds and flowers of cultivated trees, shrubs and vines. In the garden it eats seeds as they ripen, and nips off tender young vegetables, especially peas and lettuce, as they appear above ground. It damages wheat and other grains, whether newly sown, ripening or in shocks. As a flock of 50 sparrows requires daily the equivalent of a quart of wheat, the annual loss caused by these birds throughout the country is extremely great. It reduces the numbers of some of our most useful and attractive native birds, as bluebirds, house wrens, purple martins, tree swallows, cliff swallows, and barn swallows, by usurping nesting places and destroying their eggs and young. It attacks other familiar species, as the robin, wren, red-eyed vireo, catbird and mocking bird, causing them to desert parks and shady streets. Unlike our native birds whose place it usurps, it has no song, but is noisy and vituperative. It defiles buildings and ornamental trees, shrubs, and vines with its excrement and disfigures them with its bulky nests.

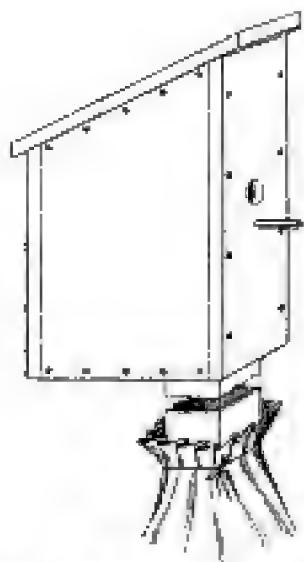
The evidence against the English sparrow is, on the whole, overwhelming, and the present unfriendly attitude of the public toward it is reflected in our state laws. Nowhere is it included among protected birds.

One of the greatest objections to the English sparrow is its aggressive antagonism toward the small native birds, especially those familiar species which, like itself, build their nests in cavities. Nest boxes provided for bluebirds, mar-



Sparrow Trap, Showing Small Entrance Which Keeps Out Other Birds

tins, or wrens—birds both useful and pleasing—too often fall into the possession of this graceless alien, either by the right of discovery or by piratical assault. Fortunately, it is possible to aid the native birds by selecting suitable nest boxes.



Sparrow House with Trap in Floor and Bag Catch.

Thus, a box having an entrance 1 in. in diameter will admit house wrens, but not sparrows. Boxes for larger birds may be constructed so that any unwelcome tenants can be readily evicted. When a sparrow has had its nest and eggs removed from a box, it not only as a rule seeks another place for its next nest, but is likely to avoid that type of nest box in future.

Sparrows become a nuisance in cities by roosting in ornamental vines and in crevices about buildings. If scared out late at night, several nights in succession, they will desert the roost. A stream of water from a garden hose is a potent means of eviction. Where water is not available, small Roman candles may be successfully employed.

Though sparrows may be driven from a given neighborhood, the nuisance is merely transferred elsewhere. Here is where Uncle Sam prescribes more drastic measures. He says the most effective method of preventing the increase of sparrows is to destroy their nests at intervals of 10 or 12 days throughout the breeding season. Occasionally they build large covered nests in trees, but as a rule they build open nests in bird houses, electric-light hoods, cornices, waterspouts, and similar places.

The sparrow's habit of nesting in cavities can be turned to account against it. By providing one-room bird

houses or even packing boxes or tin cans, and putting them in trees or on a pole or buildings at a height of at least 10 ft., the birds may be easily captured after dark with a long-handled net. Another method suggested by the government experts for the destruction of this pest is shooting them with No. 10 shot, when they are feeding in large flocks.

In localities where the use of firearms and poison is restricted, the most effective means of extermination in a given territory is the nest-house trap, the funnel-shaped wire-netting trap, and the sieve. Of these devices the nest-house trap is particularly successful. It comprises an ordinary bird house, with a light tipping chamber or floor, a down spout, and a bushel bag to hold the captives. This contrivance is known as the Tesch nest-box trap and is widely used in large cities.

Where extraordinary trapping is undertaken by city authorities, the funnel-wire-netting trap is used in places where sparrows are accustomed to assemble in large numbers. Live sparrows are placed within the device to facilitate a catch, the trap being baited on the floor of the first inner chamber, with seeds and small grain.

SPEEDOMETER SHOWS ELEVATOR TRAVEL

A speedometer for elevators is being placed on the market by a Chicago concern. It can be quickly and easily attached to the head shaft or in the end of the driving shaft of the elevator mechanism, where it records all elevator mileage. With such an attachment all guesswork as to how many thousand miles a set of cables travel is done away with, thus making it possible to base cable guarantees upon car mileage.

A tract of land about a mile and a quarter wide has been secured for the erection of a mammoth wireless station at Port Monmouth, N. J., to be used in connection with the trans-Atlantic service.

AN ITALIAN VILLA THAT WILL COST BUT \$4,900

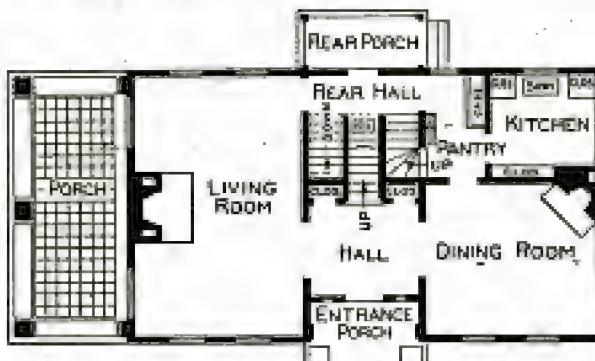


Front Elevation of the Italian Villa



Leon Garsos, Architect, New York

Second-Floor Plan



First-Floor Plan

There was once a time when only the wealthy could hope to own an Italian villa. That day has passed, however, and now this alluring style of architecture is being used for homes of men of small means. The Italian idea worked into a home for a small family has resulted in the presentation of a number of very pretty plans. The house shown in the accompanying plans was especially designed to meet the needs of such a family. The estimated cost is \$4,900 based on the price of materials in New York City. Seven rooms, large hallways, and ample closet space are provided. The architect intended this house to be built of wood, the exterior painted white with green trimmings. All the interior woodwork should be hardwood, properly stained. It will be noted that the living room, the owner's room, and the porch are exceptionally large and light.

GASOLINE PRODUCTION FROM NATURAL GAS

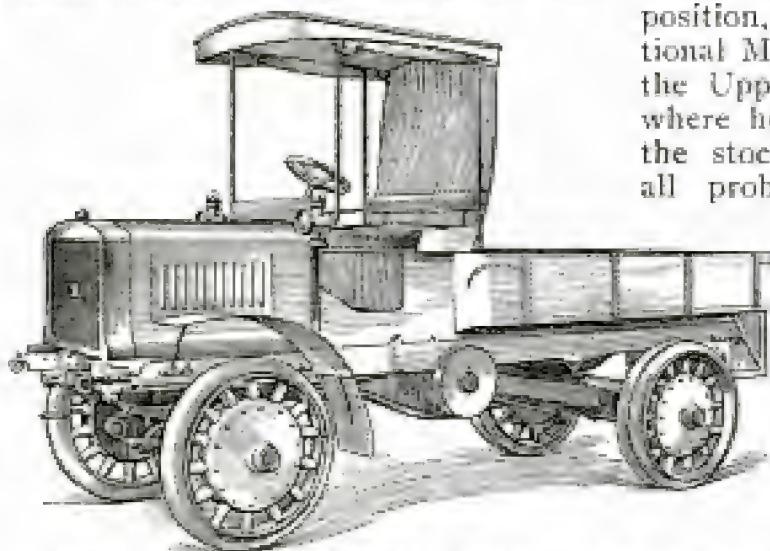
The extent of production of gasoline from natural gas, particularly the natural gas from oil wells, is steadily growing. One of the interesting developments is the extraction of oils of low boiling point from wells by attaching a vacuum pump to the well

casing and causing the oil to distill out with the gas. This is condensed again at the atmospheric pressure, the gasoline thus obtained being heavier and more valuable for general use than the lighter products.

Lawn tennis has become an exceptionally popular sport among high-school and college students in Japan.

A MOTOR TRUCK WITH FOUR DRIVEWHEELS

This motor truck, constructed in France, is designed to carry heavy loads on roads having steep grades but



A French Motor Truck, Driven by a Gasoline Engine, All Four Wheels of Which are Used for Both Driving and Steering.

no sharp curves. All four wheels are both driving and steering wheels, driven by a 6-cylinder motor giving 35 hp. at 1,000 revolutions per minute, and 45 hp. at 1,400 revolutions.

The wheels are so connected to the steering gear that the front and rear wheels on each side are each turned to the same degree in steering, and thus the rear wheels follow in exactly the same line or track as the front wheels. By means of a single differential of special construction, which is one of the chief features of the car, it is possible to provide the necessary difference required in the speed of the left and right-hand wheels to obtain correct running in a curve.

According to the food-inspection decisions of the Department of Agriculture, canned foods will be deemed adulterated if they are found to contain water, brine, syrup, sauce or similar substances in excess of the amount necessary for their proper preparation and sterilization. Some food products, such, for example, as tomatoes, may be canned without any other substances whatsoever.

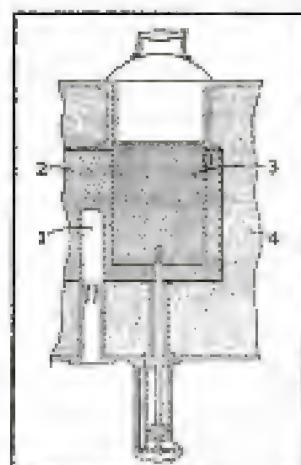
TRACING THE AMERICAN INDIAN TO ASIA

In preparation for the extensive anthropological and ethnological exhibits of the Panama-California Exposition, Dr. Ales Hrdlicka, of the National Museum, is on an expedition to the Upper Yenisei region of Siberia, where he will study the remnants of the stock of people from which, in all probability, the American race branched off.

Among the natives of the Yenisei are found physical types identical in every essential respect with the American Indian. This type extends from the Yenisei as far as Tibet, and it is the plan of Dr. Hrdlicka to make a rapid survey of the numerous and little-known peoples to be found there. He will come into as close a contact as possible with many of the native tribes, securing photographs and casts of the individuals as well as of material objects.

AN ELECTRIC STOVE THAT STORES ENERGY

A stove designed to consume electrical energy continuously at a constant low rate throughout the entire 24-hour day, and give off energy quickly, as needed for cooking purposes, has been patented by a Massachusetts inventor. The energy is stored thermally in masses of cast iron, insulated from external influences by means of lamp-black or powdered silica. The cooking utensil rests on top of and in direct contact



with the block of cast iron during the cooking operation. In the illustration, the heating element is shown as 1; the heat-storing masses, as 2 and 3, and the heat-insulating material, as 4. The mass 3 is connected to a hydraulic plunger so that it may, at will, be elevated to expose its upper surface for cooking purposes, or lowered to retain the heat.

AUTOMATIC MAGAZINE SCREWDRIVER

An automatic magazine screwdriver for driving metal screws into tapped holes has been brought out by an English concern.

The apparatus is merely an attachment to an ordinary drilling machine and is very rapid in its operation. When the screw is bottomed, the screwing head is automatically tripped, the spindle continues turning, automatically feeding another screw into the head, which was released from the previous screw by the tripping action; and the machine is ready for placing a screw in the next hole.

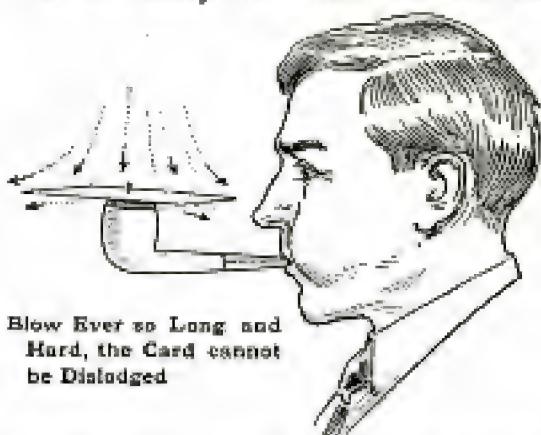
A similar machine for driving screws into wood is also supplied by the same concern.

BLOWING A CARD FROM A PIPE

At first thought, nothing would seem simpler than blowing a card off from a pipe, if the card is laid horizontally on the bowl of it and one blows through the pipe stem; but when one tries it, he is amazed to find that he cannot do it. In order to make the experiment satisfactorily, a pin should be put through the card into the bowl of the pipe, so that it cannot slide off sidewise. Under these conditions, the card cannot be

blown from the pipe except occasionally by a very sudden puff.

The uncanny fact that the card can-



Blow Ever so Long and Hard, the Card cannot be Dislodged

not be blown from the pipe depends upon some of the peculiar principles of aerodynamics. One would feel certain that, when he blows, the card would fly immediately into the air. It will be noticed, though, that the column of air which ascends is only as large as the bowl of the pipe, while the surface of the card which is expected to be lifted is many times greater. As soon as the card rises a little, the downward pressure holds it to such an extent that the air flows out sidewise in every direction along its surface. When it gets to the edge of the card, it draws some of the air from the upper side along with it. This causes a current of air from above to descend upon the card and to hold it down.

COMBINED HARDWOOD-BLOCK AND STEEL TIES

A new type of steel railway tie, claimed by its inventor to possess all the good points of the wooden tie in combination with the best features of the steel tie, is interesting railroad men



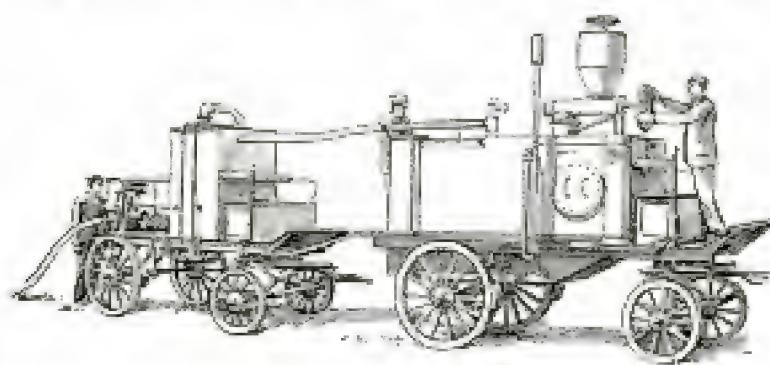
A Steel Tie Claimed to Have All the Advantages of Hardwood or Creosoted Ties, and All the Additional Good Points of Steel

to such an extent that several roads, both east and west, are about to give it a trial.

It is said to be the only steel tie that requires no insulation, as the rails rest upon hardwood blocks; that it is noiseless, and that it does away with the resiliency of steel on steel, which is present in practically all other steel ties that have appeared. The different features of the tie are clearly shown in the illustration: the hardwood blocks and method of securely fastening them in the steel channel; the method of attaching the rails to the blocks, and the open space in the bottom of the tie at the center, which is provided to prevent center-binding and to keep the track from getting out of line. The channel is filled with road ballast.

PORABLE HYDROGEN GENERATOR

The fact that a more general use of the dirigible balloon is made in Germany than in any other country has led to the invention of several types of hydrogen generators, stationary and portable. One of the latest portable plants is shown in the accompanying illustration. It utilizes the silicon-sodium-hydroxide process, and requires no external application of heat in the generation, necessary heat being supplied by the reaction itself. A small gasoline engine is used for drawing the required water supply from any convenient source. The production of one cubic foot of hydrogen requires



A Portable Hydrogen-Generating Plant Designed to Supply Dirigible Balloons

only about 1 oz. of silicon and 1.2 oz. of caustic soda. The plant has an hourly capacity of about 4,200 cu. ft.

CREMATORIES HEATED BY ELECTRICITY

There has been in successful operation at Oakland, Cal., for the last few months, an electrically heated crematory. This crematory has three retorts, each consisting of a brick-lined chamber with an arched covering. Along the two inside walls is placed about 70 ft. of $\frac{5}{8}$ -in. calorite resistance rod. The body to be cremated, enclosed in its casket, is put in place while the retort is cold. An electric current of about 85 kilowatts is then supplied to the resistance rod, and in 30 to 60 min. the temperature in the retort rises to approximately 2,000 deg. F. As the temperature of the retort increases, the volatile products go off as gases, and after about two hours nothing remains but the ashes, which are collected on a clean tray beneath.

This method of cremation not only eliminates the disturbing flame and roar, and dirt of the ordinary incineration plants, but at the same time allows the furnishings of the building to be made as elaborate as in any chapel.

DEVICES WARN OF DANGER OF ELECTRIC SHOCK

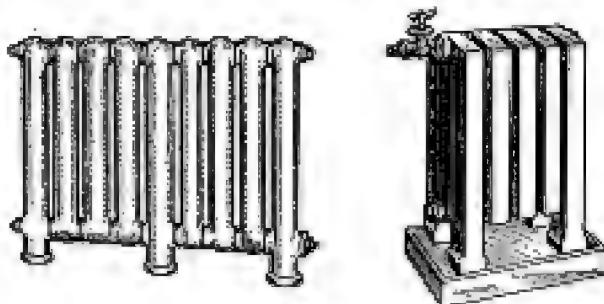
A high-tension circuit may be dangerous to anyone working on a neighboring low-tension circuit, owing to the electrostatic effect produced, quite apart from any question of leakage. This and leakage are both dangerous to linemen and a number of instruments have been designed to give warning. Vacuum tubes or sensitive telephone receivers are said to constitute the best protection. If a high-tension circuit is approached by a lineman holding a sensitive telephone to his ear, and keeping a finger on one terminal and leaving the other free, a clear buzzing is heard 3 or 4

yd. away from the conductor, caused by a small charging current passing through the coil, then through the observer's body to the earth. The vacuum tube is used by hanging it on the suspected cable, where it glows, if high pressure is present.

GERMAN CONCRETE RADIATORS

Germany has found concrete to be an excellent material for the construction of radiators for steam and hot-water heat, and at recent hygienic exhibitions such radiators were shown in all possible forms and colors.

The most important feature of these radiators has to do very intimately with hygiene. Being porous, they furnish moisture as well as heat to the air in a room, which is most desirable. It is also stated that they heat more quickly and cool off more slowly than an iron



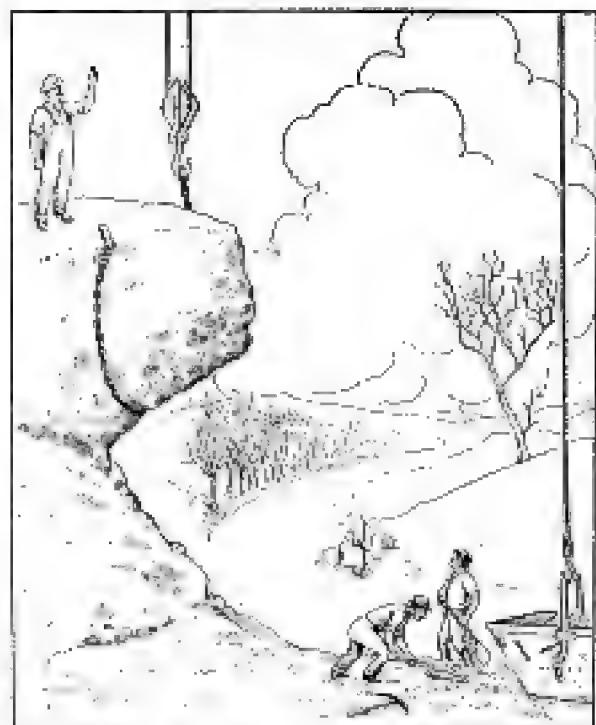
Two Forms of Concrete Radiators Constructed in Germany

radiator, and that they cost much less than the latter.

The radiators are formed by pouring a mixture of cement and sand into special gypsum molds, or iron castings, and can be made in all colors and shapes. The thickness of the walls is about $\frac{3}{8}$ in.

EXCAVATING FROZEN EARTH WITH DERRICK CHAIN

During the work on one of the New York subways last spring a large pile of excavated material which had been conserved for use as concrete aggregate had become frozen to a considerable depth. In making use of this material the shovels cut under the pile, and



An Ingenious Method Adopted to Cut Down a Frozen Projection of Earth

the projecting knob was then cut off in the ingenious manner shown. A steel bar was driven into the projecting mass, the end of a chain was made fast to the bar and looped around under the knob, and a pull of the derrick cable sheared it off neatly.

REVOLVING RUBBER HEEL

A novelty in rubber heels is one which revolves slightly at every step. The idea of the revolving feature is to prevent it from running over or wear-



A Rubber Heel that Revolves Slightly with Every Step

ing high in the middle. It is also claimed to prevent the collection of snow or dirt.

Captain Amundsen has announced his intention to start on an expedition to the North Pole next year, leaving San Francisco next March or April.

THE BIGGEST PUMP KNOWN - THE SUN

By F. R. MOULTON

Among the most powerful modern machines are the great pumps used in supplying water to cities and raising it out of deep mines. One of the largest pumps in the world is at Bethlehem, Pa. It is driven by a 7,000-hp. engine. When it is remembered that one horsepower will raise 16½ tons one foot a minute, the immense power of this pump is apparent.

It is an inspiring sight to see the immense machinery of modern industry doing the work of thousands of men. But there is a larger pump than any man has ever invented which works silently and continuously all around us. Reference is made to the sun which raises into the atmosphere all the water which falls in the shape of rain or snow. It is clear that all the water which runs in the thousands of rivers that cover the earth and which fills its great lakes, came down originally as rain; for all of these bodies of water would soon fail if they were not replenished from the skies.

A little computation will show that an astonishing amount of water falls on the earth every year. Even a big rain is a much more important thing than is ordinarily supposed. In summer there are rains in which almost an inch of water falls over a large area, and occasionally there are those when two or three inches fall in the course of a few hours. An inch of water on an acre weighs over 100 tons, and on a square mile, more than 60,000 tons. Rain ordinarily falls from a height of about half a mile. The fact that it ascends in the form of vapor does not mean that the same work was not expended to raise it, as would have been done if it had been elevated to that height as water. The same amount of energy is used in one case as in the other.

The average rainfall for the whole United States per year is about 20 in. That is, on the average 1,200,000 tons of water falls each year on every

square mile in this country from a height of half a mile. There are in the United States 3,600,000 square miles. Therefore the sun has pumped up the 4,320,000,000,000 tons of water which each year fall upon the United States.

A simple calculation shows that one horsepower will raise about 3,500 tons one half mile in one year. Therefore it would require 1,200,000,000 hp., working continuously, to pump up the water to the sky which falls as rain on the United States. But the area of the whole world is 50 times that of this country, and the average rainfall on it probably does not differ much from 20 in.

It follows from this discussion that the sun pumps up annually from the earth more than 20,000,000,000,000 tons of water. It is, therefore, immeasurably beyond the most powerful pump yet devised by man. If the energy of the descending rain could be used to drive our machinery, no other source of power would be required. But this is only one of the ways in which the sun's heat does work upon the earth, and the whole amount of energy which strikes the earth is many times that which is used in evaporating the water and raising it to the sky. While the amount of energy the sun pours upon the earth is appalling, the earth is so small as seen from the sun that only one part in eight billion of the energy that streams out from it strikes this little planet upon which we live.

RIGID RULES ON SWISS STREET CARS

The rigid rules laid down for passengers on the trams of Geneva are a good example of the thorough fashion in which restrictions are formulated in all parts of Switzerland. The notices posted in the trams are as follows: Do not smoke; Do not spit;

Have small change ready; Do not delay to pay your fare; Speak clearly when naming your destination; Do not move until the conductor summons you; Do not cross your legs or otherwise impede the passage.

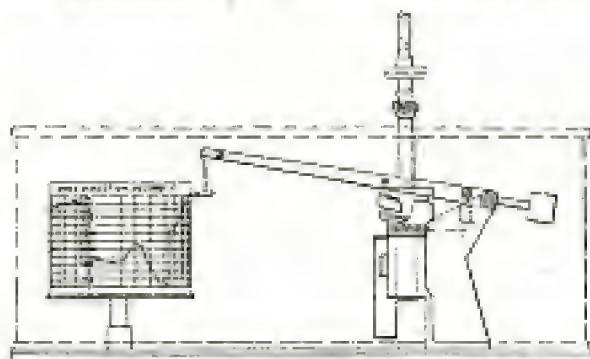
An English correspondent says that if the conductor notices a pair of crossed legs, he comes in and uncrosses them.

INGENIOUS RECORDER OF WIND DIRECTION

A London concern has constructed a very ingenious and simple wind-direction recorder, consisting of a pen which moves in a vertical plane, and traces a recording curve on the surface of a revolving drum. The pen is driven from a cam which is connected up to and actuated by a wind vane mounted at the top of a vertical spindle. The drum is driven by self-contained clock-work.

The advantage of this apparatus lies in its extreme simplicity and in the fact that the movements of the pen are vertical and the charts rectilinear. "It is obvious," says Engineering, London, "that an instrument having a simple and continuous groove in the cam could not be constructed on the lines of the figure, since with backing and veering winds, the vane, after making a complete revolution, would cause the pen to so alter its zero in reference to the chart that the readings would become meaningless. In other words, if the vane is to be free to make complete revolutions in any direction, and this is, of course, essential, there must be, at some point, a means of resetting the pen on the chart. The simple method adopted is the main point of interest in this recorder. The cam groove is in the form of a spiral, so that as the vane moves round, one way or the other, with a wind of varying direction, the pen either rises or falls on the chart. The zero adjustment is arranged for by the vertical slots at the end of the cam groove, one of which can be seen in the figure. If, owing to continuous progression in

one direction, the roller or pen lever reaches one end of the spiral groove, it immediately moves through the

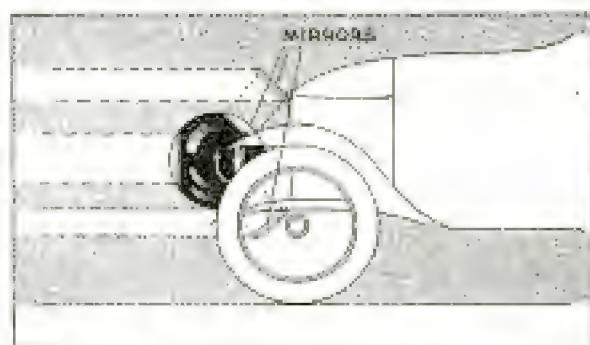


A New and Extremely Simple Instrument for Recording Wind Direction. Method Adopted to Offset Backing and Veering of the Wind is Ingenious

vertical slot into the upper, or lower, part of the groove, as the case may be. The effect of this is naturally to trace a vertical line on the revolving chart, and at the same time to alter the zero of the pen. The chart has a portion of its direction scale duplicated, so that after this vertical movement the pen still indicates correctly the direction in which the wind is blowing."

"STREAMLINE" HEADLIGHT FOR AUTOMOBILES

A novel, yet very efficient automobile headlight, receiving much favorable mention abroad at the present time, is shown in the accompanying drawing.



A New Type of Headlight Which is Practically Five Searchlights in One. The Illustration Shows Only Three of the Beams

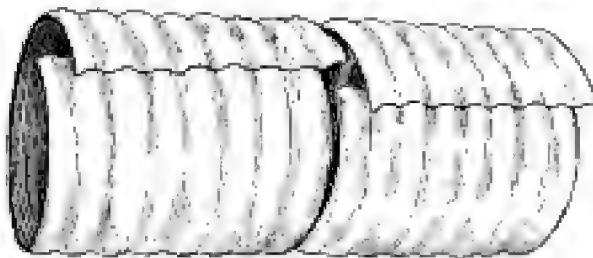
It is spoken of as a "streamline" headlight, and is claimed to fully utilize every ray of light given off by the single electric bulb, which is responsible for the production of its five pow-

erful beams, described as five search-lights. The idea carried out is that of a single spherical body containing five powerful lenses, so disposed that each is aided by the reflecting surface of the interior of the sphere. One beam goes straight forward in the usual manner, and the other four, going rearward, are caught by exterior mirrors, and set off almost parallel to the first. And

though five separate beams or search-lights are thus made available, it must not be supposed that an ordinary beam has been divided into five equal parts, giving only the same total light as the one. The outside mirrors as well as the spherical body itself are mounted on a special gate which may be swung aside so that the starting handle can be reached.

A METAL CULVERT WITH SPIRAL CORRUGATIONS

A new and interesting type of metal culvert, the corrugations of which run in a spiral, is now being manufactured



Sections of Spiral-Corrugated Culverts Just Before Being Tightly Screwed Together

by a concern in Birmingham, Ala. Greater strength than in other types of corrugated culverts is claimed, in that the spiral form allows no break in the continuity of the corrugations. One of the most interesting features is the simplicity of the joining of the 26-in. sections, which screw together as shown in the illustration, the corrugations serving as threads. The spiral corrugations are also claimed to make these culverts to a great extent self-cleaning.

WHAT IS A "HIGH" AND "LOW" VOLTAGE?

When electrical energy first came into use commercially the terms "high voltage" and "low voltage" were commonly employed to distinguish between the voltage of the series arc-lamp circuit and that used in operating incandescent lamps. Voltages, in the latter case, were limited to 50, 100 or, at the most, 110 volts, while the generators supplying current to the

arc-lamp circuit generated a voltage that in some cases reached 3,000 volts. The arc-light generators were gradually increased in size, and within a few years it was possible to get over 6,000 volts from one machine, which was considered at the time to be a really high voltage.

Shortly afterward the alternating-current generators came into the field, first at 1,100 and then at 2,200 volts, and it was not long before they were used in combination with step-up transformers which raised the voltage to values as high as 11,000 volts.

In recent years these voltages have been constantly increasing, and at the present time we have machines that generate 15,000 and 30,000 volts. These voltages may be increased to almost any value by means of transformers, and there are now in successful operation a number of power systems, employing transmission voltages of 60,000, 110,000 and even 140,000, a transmission line of the latter voltage having been put into operation recently in the United States. Voltages in the neighborhood of 1,000,000 volts have been produced in testing laboratories, for the purpose of testing apparatus to be used on high-voltage circuits, and the insulating material of such apparatus.

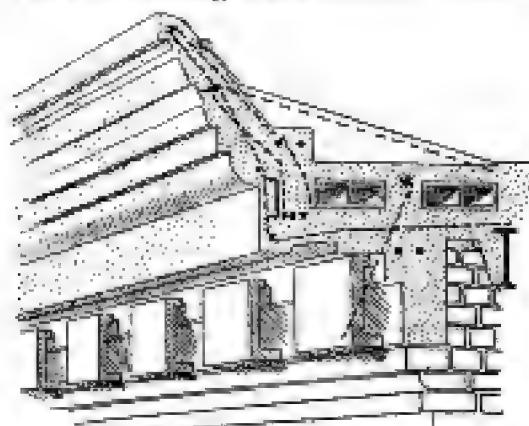
Thus, it can readily be seen that there is no distinct line of demarcation between a "high voltage" and a "low voltage," the terms simply signifying relative values; and no doubt, the highest values we have at present, will be far exceeded in the future, as the difficulties encountered in using high voltages are being gradually overcome.

INDUSTRIAL CONSUMPTION OF GOLD

The world's production of gold from 1900 to 1910 inclusive, according to estimates of Director Roberts of the U. S. Mint, was \$1,037,000,000, and of this total \$958,000,000 was used up in industrial consumption. The consumption of gold in the industrial arts for the year 1910 was \$32,657,500 in the United States; \$18,000,000 in Great Britain; \$16,838,000 in France, and \$15,536,000 in Germany. The United States industrial arts thus consumed nearly as much as its nearest competitors, Great Britain and France, together.

CONCRETE CORNICE OF MASSIVE SIZE

The new 10-story Y. M. C. A. building in Los Angeles, Cal., has a massive concrete cornice which is said to be satisfactory in every way. The cornice has an overhang of 4 ft. 3 in. from the outside of the wall, and is 5 ft. 6 in. from the base to the tip. The cantilever principle is applied in construction, the base of the cornice resting upon a section of the brick wall and corbels. Steel reinforcing bars extend from the



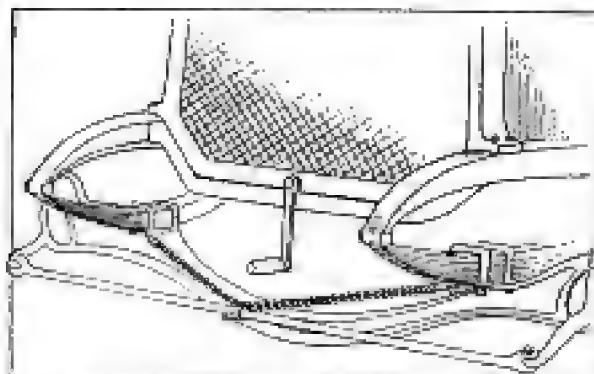
The Massive Reinforced-Concrete Cornice of the Y. M. C. A. Building in Los Angeles

concrete roof slab into the main portion of the cornice.

The intention was to put a terra-cotta cornice on the building, but the lowest bid was \$8,000. The concrete cornice cost just about half this amount.

SPRING ATTACHMENT KEEPS FRONT WHEELS STEADY

An ingenious device designed to prevent the front wheels of an automobile from being easily turned aside



This Spring Attachment Is Designed to Keep the Front Wheels Steady on Rough Roads

by obstructions, or unevenness in the road, is being marketed by an eastern automobile-accessory concern. A spiral spring about 3 ft. long, made from specially prepared oil-tempered steel wire, with a center clip and end attachments made from steel forgings, is attached between the front spring seats and the steering rod. It is claimed to correct automatically any tendency of the wheels to turn aside from a straight path.

"TITANIC" MAY HAVE STRUCK ROCK

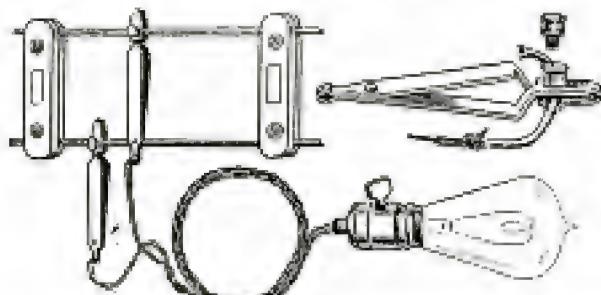
That there is a chance that the wreck of the "Titanic" may sometime be recovered, either by government searchers or by a private expedition, is the opinion of the Nautical Gazette. This is based on the theory that the giant liner did not run into an iceberg, but ran onto the point of a rock. It is pointed out that no one has set forth any specific reason, or brought out any proof that a rock does not exist at this particular spot in the ocean.

The possibility of a peak of rock existing at this place in the ocean becomes apparent to any one who studies the contour of mountains on land, says the Gazette. Peaks rise abruptly to vast heights and are surrounded by contrastingly deep valleys. It is not

unnatural, when one views the geography of North America, to suppose the existence of a chain of occasional peaks rising from the ocean's bottom about as far off shore as the longitude of the "Titanic" wreck.

EMERGENCY CONNECTION CLAMP FOR WIRING

A clamp intended to facilitate emergency connection to an insulated-wire circuit without scraping or cutting



The Emergency Clamp Used for a Temporary Tapping of the Wires When an Extra Lamp Connection is Desired, and as Used in a Test Connection

away the insulation, is shown in the accompanying illustrations as used for a test connection, and also for tapping open electric-light wires when additional lighting units are desired temporarily.

The device consists of a spring-steel clamp whose jaws can be quickly separated by squeezing the wide part between the thumb and forefinger. One of the jaws has a cross groove and recess for holding the wire, and on the other jaw is a screw cap from the inner side of which project a number of sharp-pointed prongs. On release of the pressure used to open the jaws, the prongs penetrate the insulation of the wire, and are driven into a firm electrical contact with the conductor itself by a little pressure of the thumb on the top of the cap.

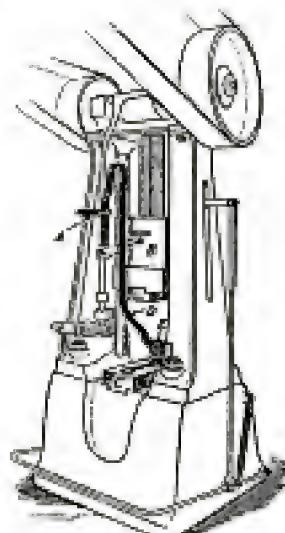
It is becoming the fad for fond fathers and mothers in London to have motion pictures of their children made, one photographer of the British capital, who makes a specialty of such work, turning out a film of 640 pictures for \$5.25.

AN ELECTRICITY-ON-THE-FARM DEMONSTRATION

During the recent land show in New York one of the large electric manufacturing companies gave an extensive demonstration of the many things that can be done with electricity on the farm. A complete dairy was installed, the apparatus consisting of an electrically driven milking machine, individual motor-driven refrigeration machine, milk cooler, cream separator, automatic churn and butter worker, bottle washer and ice-cream freezer. Motor-driven corn shellers, feed choppers and an electrically driven sheep shearer were installed in the barn, motor-driven laundry machinery, ventilating fans, cooking equipment, and numerous other devices were to be found in the house, and outside machinery, such as a threshing machine, silo filler, centrifugal pump for irrigation and fire protection, an automatic pump for ordinary water supply, etc., were all motor driven.

SAFETY DEVICE FOR FORGE PRESSES

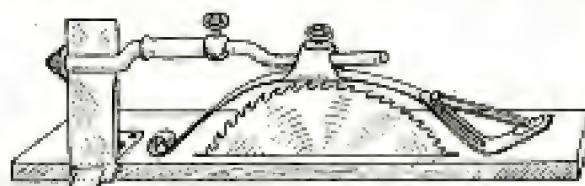
Attached to this forge press is a device for automatically preventing accidents in drop-forging shops. Drop forgings which require little machining are frequently furnished to gauge-sizes, and are therefore restruck in forging dies after the "flash" or excess metal has been removed. Through some disconcerted action, the operator, while seating the forgings in the die impression by hand, may meet with serious injury from an untimely falling of the ram, and it is to avoid such an accident that the automatic device has



been designed. It is a spring-steel device, indicated by the darker outlines in the illustration, clamped to the guide or upright at A. When the ram B descends, its contact with the device, at D, automatically forces the hand of the operator to a place of safety, C. The leather pad E modifies the force of the blow to the operator's hand.

SIMPLE GUARD FOR RIPSAWS

A neat and simple guard for ripsaws is shown in the accompanying drawing. By means of the dovetailed hitch, or bedplate, which is attached to the table permanently, the guard proper can easily be attached and detached without having to get under the table to loosen nuts and bolts. The device can be attached to saw-



A Simple and Practical Guard for Ripsaws

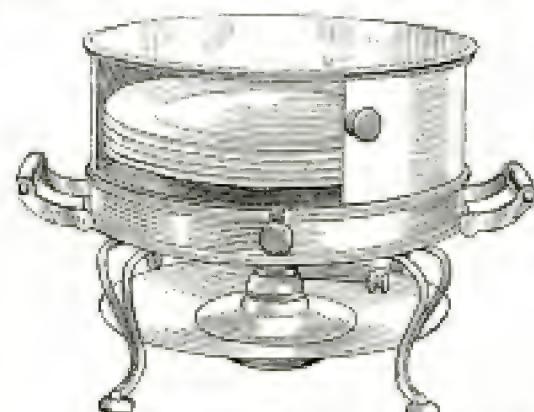
table tops of either wood or iron. It is adjustable to any size of saw from 6 up to 16 in. The adjustment is accomplished by drawing out or shoving up the two independent springs, and raising or lowering the arm on the splitter.

LIBRARY BRANCH INSTALLED IN HOTEL

A public library innovation recently inaugurated in Minneapolis would seem, on the face of it, to be worthy of imitation in many other cities. As the result of arrangements made with the library board by the management of one of the leading hotels, a branch of the library has been installed in the hotel, where its guests can obtain books and current magazines. The equipment of the branch is such as to give it the appearance of a private library.

DISH WARMER FOR USE ON THE TABLE

The hot-plate cozy shown in the accompanying drawing is a novelty that has gained much popularity in Eng-

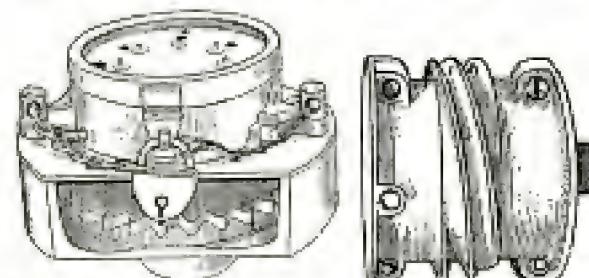


An Alcohol-Heated Dish Warmer for Table Use

land. It may be placed on a dining or serving table in the same manner as a chafing dish and takes up no more room. The same type of dish warmer may be provided with electric heat instead of the alcohol burner shown.

REVOLUTION RECORDER FOR MOTORBOATS

The International Motorboat Association sometime ago adopted the Swedish scheme of providing boats, taking part in races, with a propeller-revolution recorder. The recorder shown in the illustration, which is of Swedish manufacture, consists of two parts, one of which, the worm, is directly connected to the propeller shaft,



Propeller-Revolution Recorder for Racing Motorboats

and drives the second part, which is the calculating mechanism. The latter can be located at any convenient place in the boat.

EXHALED AIR IS A VIRULENT POISON

By LEONARD K. HIRSHBERG, A. B., M. D.

Although the ancient Egyptian physicians as well as Hippocrates and Galen recognized the importance of sea voyages and fresh air, it was only within the past quarter of a century that plenty of oxygen was realized to be an absolute necessity in the treatment of such pulmonary diseases as bronchitis, pneumonia, and tuberculosis. A pure atmosphere surrounding the sufferer, is now emphasized really more than drugs and other measures. It is considered as important to have the window in the sickroom open wide enough to throw a piano out, as it is to have plenty of water for fever maladies.

Although we have long considered pure air and free ventilation requisites to health, and while we have not minimized the cumulative and disastrous results of inhaling expired air, the true explanation of this damaging effect has not previously been given. The sad consequences of living in an atmosphere charged with the waste products of our lungs have always been declared due to vitiated carbonic acid, and absence of oxygen. Humidity, increased temperature, and similar doubtful factors, have been the inferential goats.

Attempts hitherto made to isolate from air breathed out of our lungs, specific toxins, injurious compounds, poisonous chemicals, and proteins supposed to cause suffocation, anæmia, and other maladies, have been hopeless failures. Whether an animal was allowed to live in and breathe the exhalations of man or other animals, or whether such expiratory blasts were inoculated directly into the animal's blood vessels, no satisfactory conclusions could be drawn.

True enough, it was finally and for all time determined by dozens of skilled bacteriologists, that all sputtered, coughed, and sneezed mucus, as well as the particles of mouth and

nasal fluids scattered in talking, carried large numbers of disease-producing bacteria in the accompanying spray. But this dangerous method of spreading infectious diseases could not clear away the fact that expired air, even though aseptic—free of microbes—destroyed life.

Prof. M. J. Rosenau, of Harvard University, formerly of the Bureau of Hygiene of the United States Department of Agriculture, who has made so many other important discoveries relating to preventive medicine, has offered the first logical proof in support of a reasonable explanation of why expired air is poisonous to those who breathe it.

This investigator was the first scientist in this country to explain why some animals exhibit a strange sensitiveness to certain foods or serums. He named this condition, "anaphylaxis" or "hypersusceptibility." When a guinea pig is inoculated with human blood the first time, nothing may happen. It is now said to be "hypersusceptible." If, after several weeks, another injection of the same kind of blood be given to the same animal, it will become very ill and may die.

This suggested to scientists that hay fever might be due to hypersusceptibility to plant protein, hives to hypersusceptibility to tomatoes, berries, fish, or shellfish proteins, and one variety of asthma as due to hypersusceptibility to horse serum.

Professor Rosenau has taken various amounts of expired air, and inoculated it into guinea pigs. After ten days, a second injection caused the animal to die. He proved to the scientific world that the expired air of animals, contains a definite organic protein, which when inoculated into animals, makes them dangerously susceptible to a second injection from the original animals that exhaled the air.

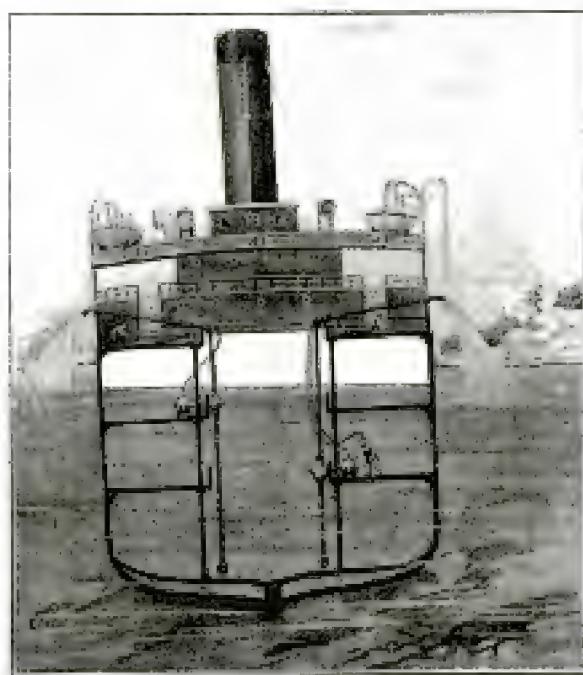
Professor Rosenau's acknowledged

standing in the scientific world makes his startling results doubly assured of a hearing. He says: "In condensing the vapors from the expired breath of man, injecting the liquid so obtained into guinea pigs, and, after an interval of several weeks or more, testing them to see whether they have become hypersusceptible to normal blood, positive reactions were obtained in a large number of cases."

This, if verified by other investigators, will disprove the popular notion that bad ventilation, impure air in churches, close theaters, and other crowded gathering places, and living rooms, signify only carbonic acid, or absence of oxygen.

SUBMERSIBLE ELECTRIC MOTORS

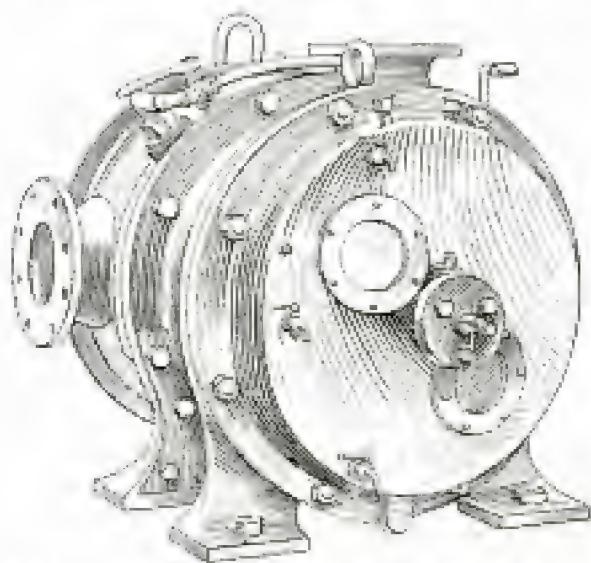
The submersible electric motor, developed in England, is designed especially for use on shipboard, for the salvage of ships, and in mines. It is claimed to be particularly practical for use on decks exposed to breaking seas, in the operation of boat hoists, winches, capstans, etc. Further, in the salvage of a ship, the submersible motors and pumps can be lowered down to any deck below water, where, in the event of bad weather coming on, they would not be in danger of



Submersible Motors in the Water-Filled Hold of a Ship

being torn away and washed overboard.

It is also claimed that the submersible motor is well adapted for use in mines in the operation of coal-cutting machines. With the motor and the switches controlling the cutting gear immersed in a tank of water, the tank being covered to keep out the coal dust, and the whole arrangement placed on a trolley, there would not be the slightest danger of explosions caused by electric sparks.



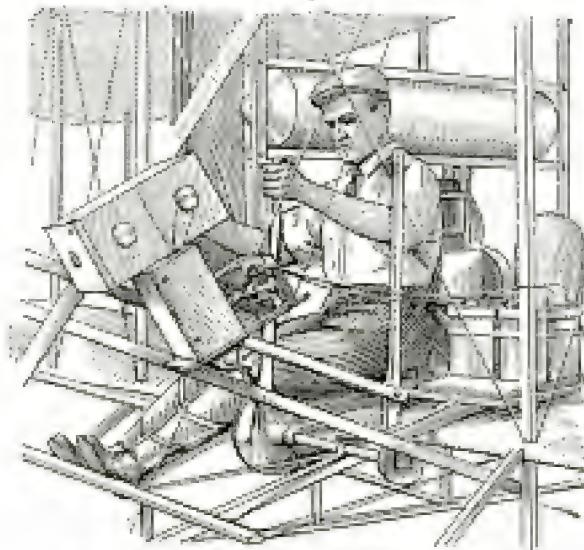
Submersible Motor for Use on Shipboard, in the Salvage of Vessels, and in Mines

MOTION-PICTURE CAMERA FOR AEROPLANES

In an illustration on the following page is shown the automatic motion-picture camera used by Frank T. Coffyn in taking motion-picture photographs from his aeroplane.

All the operator has to do is to open or close a switch to stop or start the taking of pictures, the camera shutter and the reeling mechanism being operated by two $\frac{1}{2}$ -hp., 6-volt electric motors, which receive power from two storage batteries fastened to the passenger's seat next to the engine. The boxes shown at the top of the apparatus contain the film, the unexposed

film being reeled off in front of the lens from one box and wound up again in the other. The motor speed is 1,800 revolutions per minute, and the gear



A Motion-Picture Camera Especially Arranged for Aeroplanes

reduction to the camera is 14 to 1, giving a speed of 128 revolutions per minute.

The ease with which the apparatus can be operated by the airman without distracting his attention from the proper control of the aeroplane, is said to make it ideal for aerial motion-picture work.

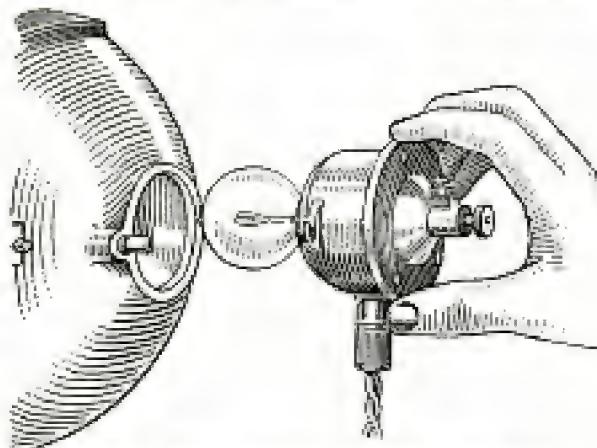
WATER POLLUTION TESTED BY ELECTRICITY

In a water-testing device, recently brought out, use is made of the conductive properties of water, containing different impurities, in determining the amount of impurities present. A chart is first made showing the relation between the impurities present, as determined by chemical analysis, and the electric-conductivity measurements. Subsequent conductivity measurements may then be used in finding, with a reasonable degree of accuracy, the degree of pollution. These conductivity measurements do not, however, discriminate between one kind of impurity in the water and another; chemical analysis alone can do that. In the majority of cases, in

engineering work, the impurities present are known, having been previously determined by analysis, and later tests are not made for purposes of analysis, but only to find out how much of the known substance is present in the water; and in all such cases the tester gives the desired result with a rapidity and simplicity far exceeding that of any chemical test.

HEADLIGHT CAN BE USED AS TROUBLE-FINDER

A new combination automobile headlight and "trouble-finder" has been brought out by a Milwaukee manufacturer. The headlight, which is shown in the illustration herewith, is made of a silver-aluminum casting about $\frac{1}{16}$ in. thick, with the interior ground to a high mirror-like polish. By giving the socket at the rear of the lamp a slight turn to the left the bulb is removed so that the light may be used as a portable lamp for hunting trouble around the motor or other parts of the car. With the socket thus removed,



Headlight Which may be Detached and Used about Car

bulbs of various candlepowers may be used as required in city streets or on country roads.

Coal, bearing gold assaying \$2 per ton, has been discovered at Cambria, Wyoming, the roof of the coal bed having been found to be formed of alluvial sands washed down on the coal in a former age.

WATCH-CASE TELEPHONE TRANSMITTER

A sanitary vest-pocket telephone transmitter, the purpose of which is to provide any individual who desires with his own transmitter for use in connection with a public telephone, is shown in the accompanying illustration. Its use, however, would require that all public telephone instruments be equipped with extra terminals.

The vest-pocket transmitter, including the watch-casing, is but 1 in. in diameter. The mouth-piece is collapsible, and, on pressing the button which releases the lid of the case, a spiral spring pushes it out into operative position. The case has two sockets which connect with special terminals on the stationary telephone instrument or the desk stand. In making this connection the regular transmitter is automatically shut out of the circuit. The illustration shows the transmitter attached to a desk phone equipped with the necessary terminals for its use.



Watch-Case Telephone
Transmitter Attached to
Special Desk Phone

INNOCENT "SALTING" OF ORES

Back in the days when the prospectors tramped through the gold regions seeking the fortune-laden veins, "salting" was a term that gave the idea that some dishonest man was endeavoring to profit by creating a false impression as to the value of his property, but, as explained in the Mining and Engineering World, there are a great many cases in which the criminal motive is entirely lacking. Ignorance and

carelessness are responsible for the salting.

One of the common cases cited is the use of coin bags, such as are commonly used by the mints and subtreasuries and banks for the transportation of coin. Very few other than public assayers realize to what extent these bags are used as containers for samples. If anyone will take the trouble to closely examine a freshly minted coin under a microscope, he will readily appreciate how it happens that bags used to convey coins are capable of yielding so much abraded gold. The edges are extremely sharp and rough and the fine particles of gold found in the bags as the result of the rubbing together of the coins are usually of such shape that they become entangled in the cotton fibers of which the bag is composed and it is an extremely difficult matter to dislodge them by shaking the bag. The result is that the gold works onto the ore sample and the sample is unconsciously salted.

Another explanation of the innocent salting is found in the shortage of sample bags. An engineer starting on a sampling trip does not care to burden himself with extra equipment, so, as a rule, he does not take with him enough bags to contain all his samples. It is a very common practice in a case of this kind to place two samples in a single bag, separating them by means of a piece of string tied about the middle of the bag. If the samples are removed at each end, allowing the string in the middle of the bag to remain in place during the operation, salting will not occur; but if, as is usually the case, the top sample is removed and then the string is untied and the second sample dumped out, salting may take place.

The use of porous and inferior grades of sacks is another very common cause for salting. It frequently happens that the "fines" are the most valuable part of the sample, and if the container has loose texture, a more or less important loss of the fine material is bound to

take place. Not only is there danger in a case of this kind of the "fines" being lost altogether, but there is equal danger of the fine material of one bag finding its way into another bag.

Again, the use of canvas for catching samples after they have been broken down has been the cause of many cases of innocent salting. Canvas has a tendency to retain "metallics" and fine sulphides and to yield them up at the wrong time and place.

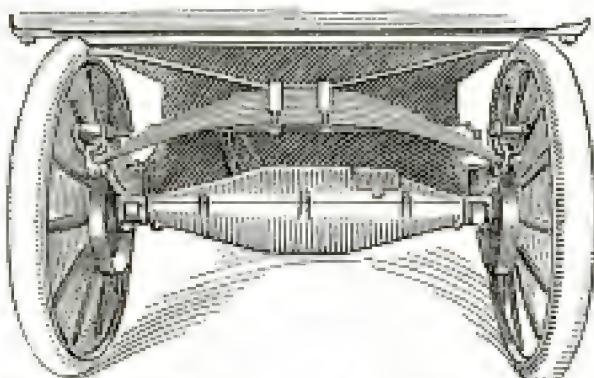
Contaminated tools are sometimes the cause of salting. In picking down a rich gouge, any kind of sticky high-

grade material, there is a tendency for some of the ore to cling to the point of the pick, and if the tool is afterward used on a low-grade material without being cleaned, salting will almost invariably occur.

The innocent salting of samples is not confined to those who take them, for in the laboratory in which the samples are assayed are found many instances. The retention of gold on the face of the grinder is another point deserving mention, and too few assayers have given this matter the attention it deserves.

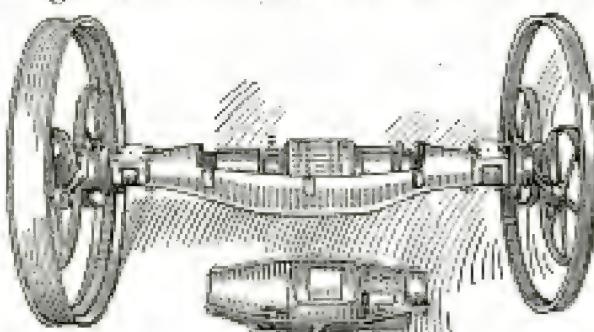
ELECTRIC MOTOR CARS WITH MOTOR IN HOLLOW AXLE

An electric car having a balanced-drive power plant inclosed in its hol-



Exterior Appearance of the Hollow Axle Containing the Motor

low rear axle, the wheels being driven by means of an idler and rim gear, turned by the pinions of the motor's shafts, is shown in the accompanying illustrations. The power from the single motor housed in the hollow axle



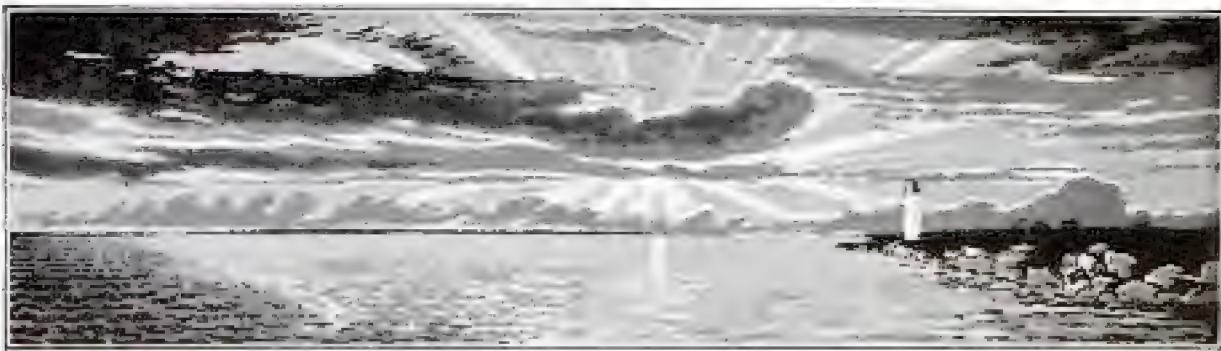
Half of the Motor Casing Removed, Showing Details of the Arrangement

is transmitted through the direct-connected differential and the drive shafts to each rear wheel, the drive-shaft pinions transmitting the power through the idler gears to the large rim gears fastened to the tire rims of the wheels. In this way the power is claimed to be transmitted in the most direct and efficient manner to the place where it is used, that is, the tires of the wheels. The drive pinions and shafts have no bearing except the teeth of the idler gears, between which the pinions float in a balanced manner.

CONCRETE REFRIGERATORS

Concrete refrigerators of pleasing appearance are being manufactured by a concern in Indianapolis, Ind. The framework is a steel skeleton, which is covered with wire netting, plastered inside and out with cement, and given a coating of hard white enamel. About three weeks are required for the setting of the walls, after which the waterproofing is applied, followed by two coats of cement enamel.

A Japanese steamship line is to be established between Yokohama and New York as soon as the Panama Canal is completed, 11 steamers having been contracted for by the projectors of the enterprise, which is to be run under a government subsidy.



The Wonders of Light

By J. GORDON OGDEN, Ph. D.

VI—The Illusions of the Eye

This is the sixth of a series of articles by the author of "Heat" and "The Kingdom of Dust," which have appeared in this Magazine. Dr. Ogden is professor of physics in the Fifth Avenue High School, Pittsburgh, Pa.

WE are dependent upon our senses for our knowledge of all things external. We see, hear, smell, taste and feel through the agency of tiny little threads called nerves. The brain is the editorial sanctum, and the nerves are the special reporters, whose business it is to bring news from the outside world.

Throughout the human system is a complicated network of nerves, extending to the remotest frontiers of the body, and the news service thus afforded is unexcelled for accuracy and speed. As soon as any bit of information comes to

any of these reporters, it is telegraphed at once, sometimes to a relay office, sometimes directly to headquarters, where it is edited and the information immediately acted upon, if prompt action is necessary.

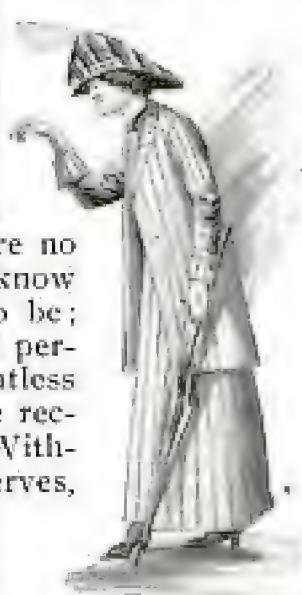
And yet, so far as news interpretation is concerned, the editorial system is often at fault. It is a common mistake, made

by practically everyone, to attribute to the external world properties that are peculiar to the brain. For example, we associate the sound of a bell with the bell itself. We think that the green of a beautiful lawn is a property of the grass. That the perfume of a rose is the individual, private possession of the flower. That sugar, likewise, has the inherent quality which we call sweetness, and that salt and quinine possess the peculiar tastes we always associate with these substances. This is where the editorial system of the body is at fault. From the editor-in-chief, down to the humblest cub reporter, credit is not given where credit is due. If there were no eyes, light, as we know it, would cease to be; and with it would perish all its countless children which we recognize as colors. Without auditory nerves, there would be absolutely no sound in the universe,

and the wonderful harmonies of nature, as typified in the sighing of



"A very stout lady would do well to avoid horizontal stripes in selecting her dress goods."



"A tall lathlike individual should refrain from perpendicular lines in her costume."

POPULAR MECHANICS

the wind, the thunder of the surf, the melodious flutings of the feathered

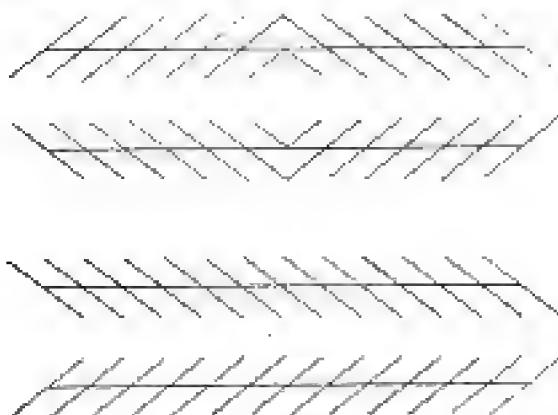


Fig. 1—Zellner's Lines: The Long Lines are Parallel
songsters, as well as the stately measures of the "Largo," would be forever beyond our ken.

Light and sound, externally, are simply forms of vibratory energy which knock at the several gateways to the brain, and are admitted under a false conception of their real nature. We do not give to the brain its proper credit. Light waves, as we have shown in a former article, are simply quiverings of the mysterious ocean of ether.

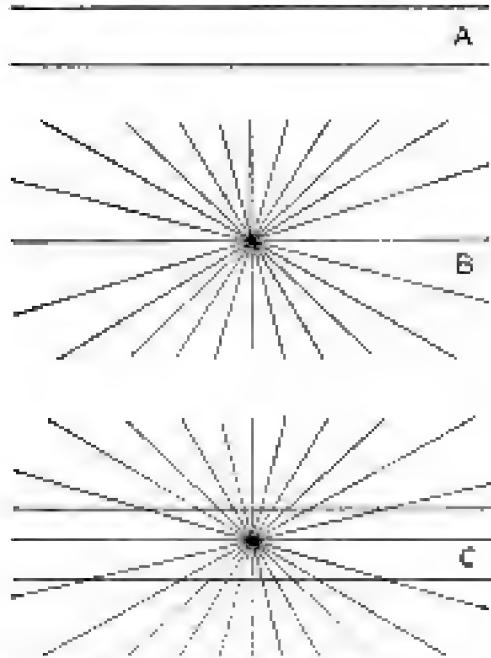


Fig. 2—Placing A upon B Produces the Curlique Effect Shown at C

These tremulous, delicate little disturbances, in some obscure manner, give

rise to the sensation of light and color in the brain. It is just as improper to attribute the phenomena of light and color to these tiny waves, as it would be to assert that the little pellet of lead, flying from a gun, is pain, simply because it produces pain when it crashes into the delicate tissues of the body.

Light and color, sound and odor, taste and touch, are brain-made. It is the consciousness that sits at the end of the telegraph wire that interprets the little electric thrills into messages of hope or despair, of joy or sorrow. Without the operator what would a telegram be? Simply a quivering, a motion as material as the swaying to and fro of a pendulum.

A curious corollary follows from this

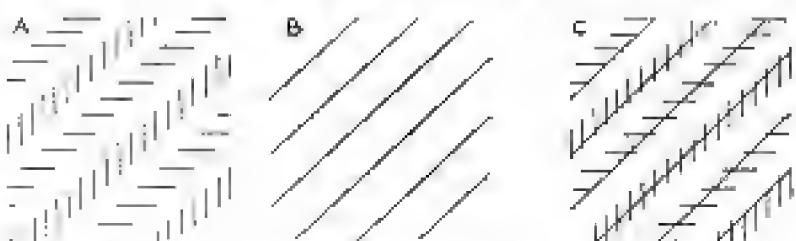


Fig. 3—Zellner's Lines: A Combined with B Produces the Peculiar Effect of C

truth. As a matter of fact we do not know just what any other person feels. We are like solitary islands in a vast ocean. We do our own perceiving, and there is no possible way by which we can come to a knowledge of what anyone else perceives. We agree in saying that "the rose is red, the violet's blue," and further declare that "sugar is sweet," but there we stop. Just what red, or blue, or sweetness is to anyone else we are unable to say. If we could exchange bodies we might know; but even then it is quite probable, if such a thing could be, that we would be compelled to learn the simplest facts all over again, and to readjust the relationships between the phenomena and the names by which we have been accustomed to distinguish them. Possibly the impression produced in one brain by the beautiful blending of colors in a sunset may impress another brain in an entirely different way. Possibly the "Apassionata" of Beethoven may affect us as a Turner landscape

affects someone else. To repeat, we do not know what any other person feels.

It is partly this peculiar state of affairs that is responsible for what are known as illusions. All the senses may be readily deceived. If we roll a marble under crossed fingers, we are quite certain, so far as feeling is concerned, that there are two marbles. We are often unable to tell from which direction a sound comes. A moderately warm room seems cold to one who has just come from a very hot kitchen, while the same room seems to be quite warm to one who has just come in from the street where the temperature is hovering around zero. It is the eye, however, and the sense of sight, which are peculiarly prolific in the matter of illusions. We really see two images of everything we look at. Close one eye, and we are unable to calculate distances. Let us accustom ourselves to the atmospheric conditions of one locality, say in New York, then attempt to estimate distances in Denver, and ludicrous mistakes follow.

The cause of optical illusions is psychological rather than physical, and, strictly speaking, it is the "wonders of the mind" rather than the "wonders of light" that produce them. We are creatures of habit, and accustom ourselves to judge light phenomena in a certain definite manner. Should these phenomena present themselves in a novel manner, we are all at sea immediately, and permit our attention to wander, or allow our judgment to be warped.

Figures 1, 2 and 3 may be termed illusions of vision through distributed

attention. Ordinarily it is easy for us to recognize parallel lines when we give our whole attention to the problem. When, however, we allow our concentration of mind to be led away by some distracting influence, like the short, transverse lines in the illustrations, we easily fall into the trap, and are quite certain that the long lines are not parallel, or, as in Fig. 4, that the lines are of unequal length. Figure 5, the familiar "staircase" illusion, is really not an illusion according to the

psychologists, but an example of what has been termed an "equivocal" drawing, and that the staircase from underneath is as true a perception of lines, as is the staircase from above. At any rate it has all the earmarks of an optical illusion, however the psychologists may choose to explain it.

The familiar "block" illusion shown in Fig. 6, giving the perception of six cubes, or seven cubes, depending upon some peculiarity of mental processes, is also interesting in this connection.

Figure 7 shows a series of vertical and horizontal lines. In both drawings the same space is covered. Advantage is taken of this curious illusion to give height to a room by the use of

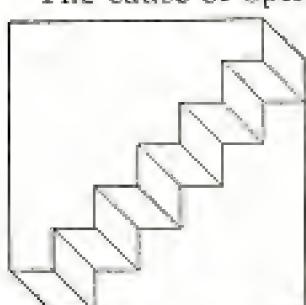


Fig. 5—The "Staircase" Illusion: Do You See It from Above or from Underneath?

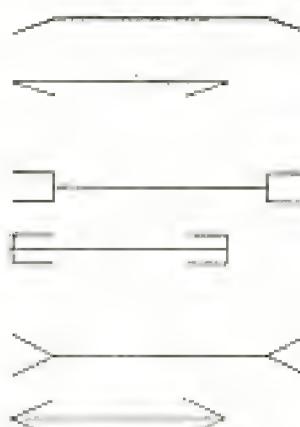


Fig. 4—The Long Horizontal Lines are All Equal in Length

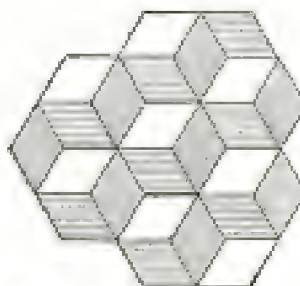


Fig. 6—The "Block" Illusion: Do You See Six, or Seven, Blocks?



Fig. 7—Each of the Series of Lines Covers the Same Space

proper wall paper. Likewise, a very stout lady would do well to avoid

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horizontal stripes in her dress goods, unless she wishes her stoutness to be exaggerated; while a tall, lath-like individual would show good taste in restraining from perpendicular lines in her costume.

Figure 8 will cause most of the readers of this chapter to look for their rulers or tapelines. It hardly seems possible that the vertical line is not longer than the horizontal line—yet it is the same length. In Fig. 9, the line outside the square is the exact length of the diagonal of the square.

Figure 10 is an illusion of distance. When one looks at the left-hand divisions, made up of lines close together, the mind attends to these closely, and establishes a unit of measurement. When the attention is turned to the wide empty space to the right of the series of lines, immediately a larger unit is applied, and the sixth or last line of the series does not seem to be what it really is, the center of the figure.

One of the most curious illusions is that presented in Fig. 11. It is an illusion of motion. Hold the drawing vertically before the eyes, and move it slowly up and down. The oblique line will appear to slide up and down on the vertical line, as though it were not attached to it at all. Psychologists tell us that this phenomenon is due to the fact that the mind underestimates the speed at which the drawing is moved. It is a good example of the instability of a mental standard. It is almost impossible for the mind to form and adhere to a standard that will not vary. One might as well attempt to measure with

outstretched arms the width of a door, and carry the measurement through a crowded street to the nearest carpenter's shop.

An illusion that is responsible for the employment of at least a hundred thousand people, the investment of millions of dollars, and the amusement of everyone, from the graybeard to the urchins of the street, is based on the fact that an impression made upon the retina remains there for an appreciable time. We are familiar with the old experiment of rapidly revolving, in the dark, a stick with a glowing end, and the consequent production of a ring of fire. Of course, no ring is produced, but the illusion is perfect.

An impression made upon the retina by a strong light persists for a tenth of a second, sometimes longer. If a series of swiftly moving pictures be projected upon a screen by a stereopticon, the eye retains the impression of each picture in the series for at least the tenth of a second. If there be more than ten pictures to the second, the images gradually overlap and melt together, blending perfectly into a continuous picture where the slight movements made in each of the component pictures are added, making complete

the illusion of continuous motion.

An immense enterprise, nation-wide, even world-wide, has thus been established with an illusion as its capital stock. The moving-picture business has invaded every civilized country in the world. It is also being rapidly introduced into the remoter regions of the earth, where men and women are more primitive in their sociological ideas, but enjoy equally with their better educated brothers and sisters, the moving scenes "by field and flood."

The films are made of celluloid wound in reels that average 1,000 ft. in length. Each tiny picture measures $\frac{1}{2}$ by $\frac{3}{4}$

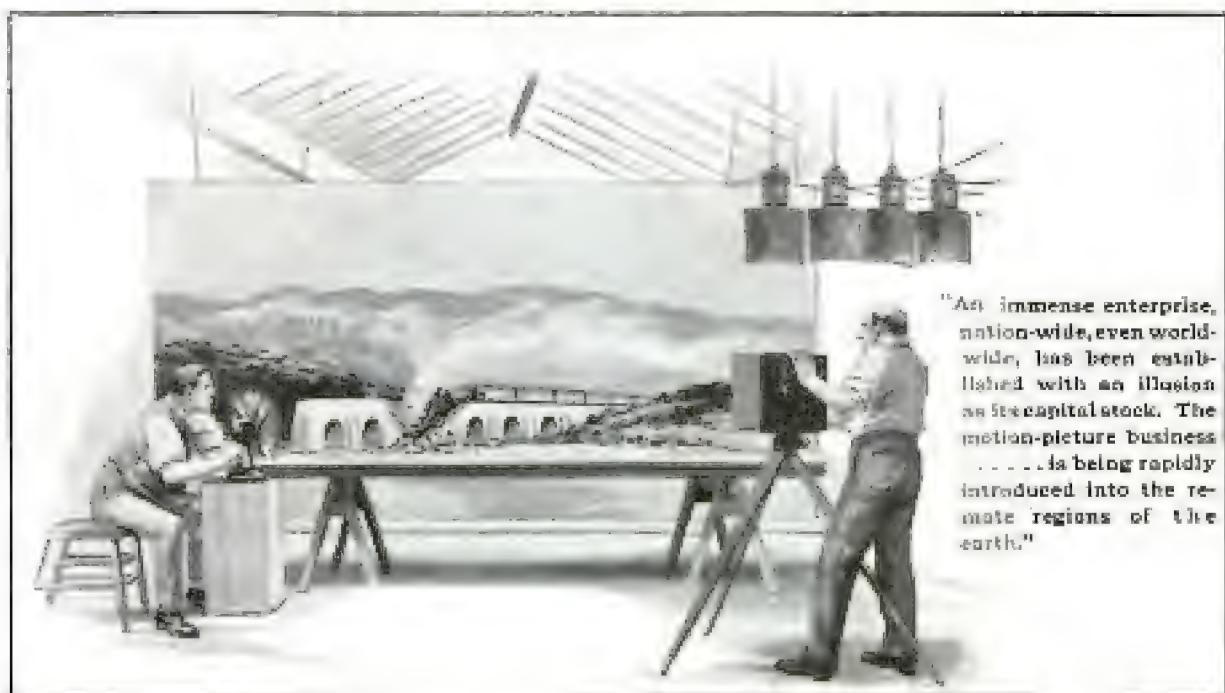
Fig. 8—The Vertical Line is Precisely the Length of the Horizontal Line



Fig. 9—The Line Outside the Square is the Exact Length of the Diagonal of the Square



Fig. 10—The Space at the Right is Equal to the Space Covered by the Six Lines at the Left



"An immense enterprise, nation-wide, even world-wide, has been established with an illusion as its capital stock. The motion-picture business . . . is being rapidly introduced into the remote regions of the earth."

in., and in an ordinary reel there are about 17,000 of them. They are run through the machine quite rapidly, about 16 to the second, thus consuming about 16 to 18 minutes for the average reel. Occasionally, when the proprietor of the show is anxious to clear the hall to make room for more nickels, the reels are run through much more rapidly, thus producing a peculiarly disagreeable, jerky effect. The introduction of a carefully adjusted revolving shutter in front of the lens, or elsewhere, does away with the "flicker" that otherwise would mar the smoothness of the picture, and which was so marked in the earlier machines.

Enormous sums are spent in the production of films delineating battle scenes and historical pageants. The "Crusader" film, a reproduction of certain historical scenes of the Middle Ages, is said to have cost its producers \$100,000. It took two years to photograph the scenes in all parts of Europe, and upward of 3,000 people posed before the

camera. One film company is reported to pay \$7,000 a week royalty on just one patent. High-priced stock companies are employed, whose sole business is to perform "motion plays" in front of the camera. Copies of these films are sent broadcast over the world, and millions of people—5,000,000 daily—are entertained and instructed by them.

There are 30,000 moving-picture theaters in the United States alone. It is asserted that the people of this country spend \$500,000,000 annually for this form of amusement—a sum greater than the yearly volume of business of the Standard Oil Company.

And all this based on an optical illusion!

Fig. 11—An Illusion of Motion: Hold the book vertically in front of the eye at the distance of best vision and move it up and down. The transverse lines will appear to slide up and down the vertical line.

A recent invention adopted by the electric company of Strassburg, Germany, is an electric transformer by means of which the lighting current may be used to operate the ordinary electric call bells, thus doing away with the necessity of stationary batteries in each house.

MECHANICAL-HORSE EXERCISER

A mechanical-horse exerciser, designed for the home or the gymnasium, and meeting with considerable



The Mechanical-Horse Exerciser of the Royal Automobile Club, London

favor in England, is here illustrated. The part of the machine representing the body of the horse is of spring-extended bellows construction. The person exercising climbs upon the mechanical horse, places his feet in the stirrups, and starts the ride, the springiness of the bellows-like body providing a rising and falling motion similar to actual horseback riding.

SMALL MOTORBOAT TOWS A WHALE

A motor fishing dory, equipped with a 6-hp. engine, is here shown towing a whale into Eastport, Me. The whale was captured by Indians of the Pass-

maquoddy tribe, who live in the village of Pleasant Point on the St. Croix River, which is the eastern boundary between Maine and New Brunswick. The whale was 61 ft. long, with a circumference of 31 ft.

GRINDING A ONE-HUNDRED-INCH GLASS DISK

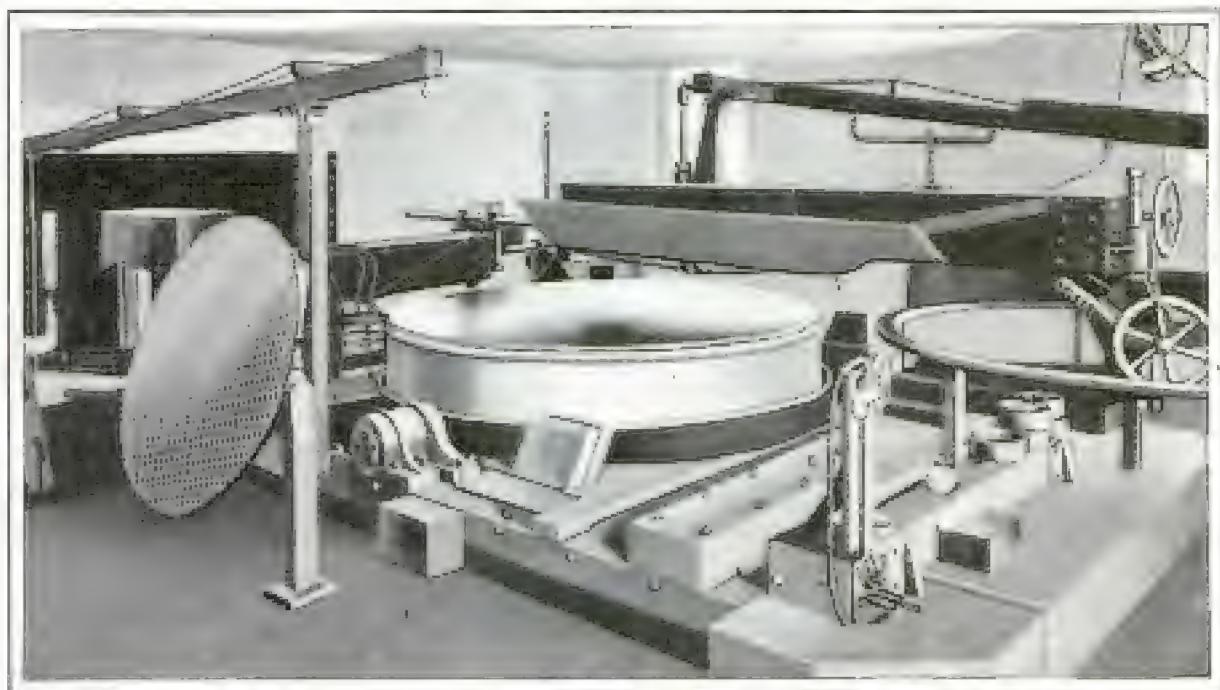
Because of the difficulty experienced by a French glass concern in producing a thick disk with a diameter of 100 in., free from air bubbles and flaws, for the reflecting telescope now in course of construction at the Mount Wilson Observatory, California, it was deemed advisable, about 18 months ago, to begin work anew upon a disk already received but rejected and laid aside.

An inspection of this disk had shown that while there were well defined sheets of air bubbles running through the body of the glass, they were located so deeply in the glass as not to interfere with securing a perfectly paraboloidal surface. Furthermore, the glass as a whole seemed to be very firmly knit together, in spite of the presence of the bubbles. Under these conditions the only obstacle to the perfect success of the disk as an astronomical mirror would lie in the presence of strains in the glass which would prevent it from maintaining its shape under different conditions of temperature.

The process of shaping the disk was therefore commenced, the work being carried on in Pasadena. At the present time the fine grinding of the spherical surface has been completed, and as soon as the polishing is finished a series of tests will be made to determine if the surface retains a true curvature at different temperatures. So far



Towing a 61-Ft. Whale into Port with a 6-Hp. Motorboat



The 100-In. Glass Disk for the 100-In. Reflecting Telescope of the Mount Wilson Observatory, on the Grinding Machine, Ready for Polishing

as is possible to judge, no changes have taken place in the flaws during the severe pressure put upon the disk by the process of rough grinding. The illustration shows the disk on the grinding machine, ready for polishing.

In the meantime the French company is continuing the attempt to cast

a disk free from flaws and air bubbles. The chief difficulty encountered in recent trials has been that of annealing in such a way as to keep the temperature of the entire body of glass uniform. Owing to this difficulty a second disk, cast early last year, broke in the annealing oven.

FIRST NURSE OF INFANT TELEGRAPH

Residing in the city of Washington, D. C., is an old gentleman, now in his eightieth year, who may be said to have been the first nurse of the infant electric telegraph. His name is Alfred G. Hall, and his age sits lightly upon him when, with the memory of his early experiences still clear in his mind, he tells some incident of those early days "when we considered it a marvelous feat that we had gotten our telegraph line working all right over the tremendous distance between Washington and Philadelphia."

Mr. Hall was born in Maine in 1831. He went to Washington in 1847.

"It was just about the time of the birth of the telegraph," he said. "My brother-in-law, Mr. Donaldson, who

was an instrument maker, was a close personal friend of Morse; indeed he made the first working telegraph instrument for him. Through him I became interested in the new invention and thus became the first manager of the first telegraph office established at Washington for business in the country. This position I held until 1852.

"In 1852 the line had been extended in working order as far as Philadelphia. The president of the company operated the Philadelphia key while I handled the one here in Washington, being manager, operator and pretty much everything else around the office. In those easy-going days we always closed the office at 10 o'clock in the evening and nothing could get over

the wire after that; night service was undreamed of.

"The telegraphic news for the papers was gathered in the most haphazard way; rather, it was not gathered at all. Anybody who thought he had anything worth printing for the Baltimore or Philadelphia papers, would drop in casually and lay his copy on the table. The Associated Press was of course a thing far in the future.

"One day some extra-careful reader of a Philadelphia morning paper, after close examination, discovered that there was no telegraphic news in the sheet. Of course that meant Washington news. The president called me up and asked if there had been turned in by anybody the day before, anything in the way of press news at the Washington office. On examination I found that a small batch of stuff had been handed the office boy during the day, but he had forgotten about it, and I, the operator, had overlooked the matter when closing business that evening—such a negligible quantity was the telegraphic service of the press in those days.

"Somehow the oversight irritated the president and there resulted a heated discussion over the wire between the president at the Philadelphia key and the Washington force at the other end, the conclusion being that the entire Washington force—myself—put on his hat and walked out of the office. But it didn't disturb the business of the country much, then, this sudden cessation of business."

Mr. Hall was succeeded by his twin brother, and thus was enabled to keep as closely in touch with the development of the telegraph as before. He mentions an odd rule that for years was in force in all telegraph offices throughout the country.

"The operator took the messages from a roll of paper tape, like that used by the stock tickers of today. On these were inscribed the Morse characters. As the operators became more proficient they found that they could read by the sound of the click, and so, instead of laboriously spelling out the

record on the tape, they transcribed it at once into English on a sheet of paper. This was the unpardonable sin in the eyes of the management and any operator detected taking a message by sound was immediately dismissed. It was thought that no man could possibly read by sound with any degree of accuracy. Today such a thing as reading from the tape is practically unknown."

Mr. Hall is the only surviving delegate to the Convention that nominated Abraham Lincoln in 1860, and sent the first message announcing it.

"There was a single key and one lone operator in the Wigwam at Chicago where the convention was held," he said. "Of course I got acquainted with the operator, and, when Lincoln's nomination was announced, I went at once to the key, and clicked the news to my brother in Washington. It was nearly an hour before another message was sent; for, what with the excitement and cheering, even the operator employed there forgot that the outside world was waiting the news.

"My brother took my telegram to Mr. Wallach, the editor of the Washington Star, which was just ready to go to press; the latter was skeptical about the correctness of the information and the paper was held back more than half an hour before the editor concluded to 'take a long chance' and print the news."

And this was barely 50 years ago!

"The skepticism with which the general public regarded the telegraph in those days seems quite amusing now," continued Mr. Hall. "Even after we had been in operation for some years, business men were afraid to intrust any important matter to what they considered such a wholly uncertain means of transmission. Prophecies were freely made that the telegraph was but a fad, a toy, that would soon pass away, like a fashion in woman's dress. The result was that for a decade, investments in telegraph enterprises were almost uniformly disastrous. One company after another started up only to go into bankruptcy for lack of business.

It was only after the Western Union, getting on its feet, began to absorb the numerous little lines that had failed,

that real stability, as a permanent factor in the business of the country, was acquired by the telegraph."

GOLF BALLS ARE IMPROVED BY TREATMENT

Golf balls with cores free from the danger of deterioration are promised in a recent improvement in their manufacture. For the purpose of increasing the resiliency of the balls the vulcanized-rubber center has heretofore commonly been soaked in a certain chemical, but when rubber tape or thread is used as the incasing material for the center, the prolonged contact between this chemical and the incasing material softens the latter, thereby impairing the state of tension in which it has been wound. The result is, on the one hand, that the resiliency of the center is reduced and, on the other, that the elasticity and tensile strength of the overlying tape is lessened. By treating the rubber center with chloroform it is claimed these disadvantages may be overcome.

AFRICA HAS GREATEST HIGH JUMPER

The feats of Olympic holders of world records in high jumping are placed in the shade when compared with the wonderful high jumps made by the long-limbed Watussi of German East Africa. They are a tall well-made people, with an almost ideal physique. Men 7 ft. 2½ in. tall are not uncommon, yet they are perfectly proportioned. The shoulders are generally powerfully built, yet the waist is at times extraordinarily slender, the hands are elegant and delicate in form, and the wrists of almost feminine grace.

Among these men have been developed the finest jumpers in the world. The best jumpers have attained heights of over 8 ft., the champion jumper, who is shown in the accompanying illustration, making a jump of 8 ft. 5 in. in an exhibition for the entertainment



From "In the Heart of Africa;" Cassell & Co.

Champion High-Jumper of Africa Making a Jump of 8 Ft. 5 In.

of the Duke of Mecklenburg, author of a volume entitled "In the Heart of Africa."

The Olympian record for the running high jump is 6 ft. 3 in., made by Harry F. Porter in 1908. The world's record for the running high jump is 6 ft. 5½ in., made by M. F. Sweeney.

According to statistics just issued by the Census Bureau, the value of farm property in the United States increased 100.5 per cent during the last census period; the value of the land alone having increased 118.1 per cent.

THE AEROPLANE AND THE SUBMARINE

In the accompanying illustration is shown the shadowy form of a submarine speeding along several feet under



Courtesy Illustrated London News
The Shadowy Form of a Submarine under the Shadow of a Swooping Aeroplane

water, and, falling across it, the actual shadow of a war aeroplane swooping after it 50 ft., more or less, overhead. It is well known, of course, that objects under water are visible from a height when invisible from the water level.

In recent British naval maneuvers one of the naval airmen swooped down to within 20 ft. of the top of the periscope of one of the submarines, following it at that height like a seagull after a fish.

ARCHITECTS' EXHIBITION DRAWINGS ON SATIN

The damage to water-color and wash drawings from handling, and in shipment to and from exhibitions, is a constant source of annoyance and loss to architects. One architect has solved

the problem by having all exhibition paintings done on satin, as this material can be rolled or folded in any shape without becoming permanently wrinkled. Colors laid on satin also produce a rich and artistic effect, a matter of particular importance in exhibition drawings.

In this work ordinary water colors cannot be used, on account of their tendency to spread along the threads of the fabric. Japanese colors of a special quality are the only ones found suitable. Even with these, the renderer must use extreme care, carrying a light brush and applying the colors delicately.

FIRST CHINESE AIRMAN IN AMERICA

Tom Gunn, Chinaman, who learned to fly in California, and is now using a machine built to his order and equipped with a 60-hp. engine, is shown in the illustration posing with the American and Chinese flags and a prize cup just after a successful flight. He is the first Chinaman in America to receive a pilot's license.



Tom Gunn, Chinaman and Licensed Aerial Pilot

MONUMENT TO A CITY ENGINEER

Nations honor warriors and statesmen by erecting to their memory monuments or statues, but it remains for the city of Havana, Cuba, to gratefully acknowledge the services of a distinguished engineer by placing the handsome marble statue shown in the accompanying illustration in Monserat Plaza.

To Francisco de Albear y Lara the city of Havana owes its waterworks system. The twin masonry reservoirs at Palatino and the splendid aqueduct from this point to the source of supply, making a gravity system carrying the pure water of the Vento springs to Havana, are more expressive and enduring monuments to the memory of General de Albear in the eyes of his brother engineers, but nevertheless it is a matter of gratification to them to know that the citizens of a great city have thus recognized the services of an engineer.



Monument Designed to Perpetuate the Memory of Municipal-Engineer Francisco de Albear y Lara of Havana, Cuba



This illustration of the British battleship "Neptune," the flagship of Admiral Sir George Callaghan, is a reproduction of a photograph taken while the vessel was leading the "dreadnought squadron" out to sea to meet the third and fifth squadrons. The interesting feature of the illustration is the set of overhanging davits to which one of the ship's largest boats is attached.

SPECIAL LATHE FOR AERIAL PROPELLERS

In the Curtiss aeroplane plant at Hammondsport, N. Y., is a lathe espe-



A Special Lathe Used at the Curtiss Aeroplane Plant for the Turning Out of Propeller Blades

cially constructed for cutting out the blades of aerial propellers. The block in the foreground is a pattern which the lathe automatically follows in cutting out the new blades, one of which is shown in position to be worked upon, on the other side of the machine.

FISH MEAL USED AS FOOD FOR COWS AND PIGS

Pigs and cows enjoy fish dinners prepared especially for them, in Norway and Great Britain, and the cheapness of the kind of fish used, together with the good results of such feed in connection with ordinary foods, may be expected soon to put fish on the diet of animals in other countries. In Norway cod and herring are principally used, according to the *Revue Scientifique*. The codfish are dried, first in the air and then in an oven, and finally the mass is ground. The herring are made into meal by boiling and then putting the mass through a press. Waste from all sorts of fish, and fish which have no value as human food, are used in England and Scotland, the process being to reduce the fish to a coarse flour by steaming, drying and grinding.

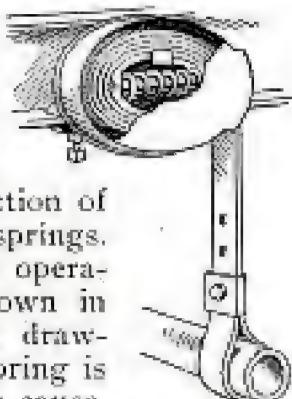
FASTER TRANSPORTATION ON TRANS-SIBERIAN RAILWAY

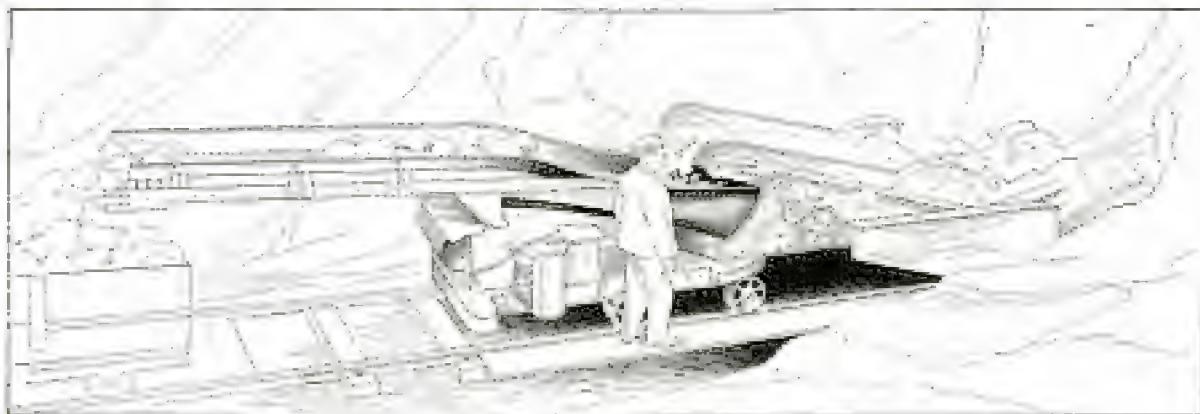
The time of the express trains on the trans-Siberian Railway has been considerably shortened this summer, and a further reduction in the running time of 24 hours will be made by next year. The time of the express trains from Moscow to Vladivostock is now 8 days 11 hours 35 minutes; from Saint Petersburg to Vladivostok, 9 days 2 hours. The time of the ordinary passenger trains from Moscow to Vladivostok is 12½ days.

The Russian Minister of Ways and Communications hopes before many years to provide a six-day train from Vladivostok to St. Petersburg.

REBOUND SNUBBER FOR AUTOMOBILES

Unlike the majority of devices designed for snubbing or checking the rebound of automobile bodies when the wheels strike a rough bit of road, this snubber will act only on the rebound of the weight following an excessive deflection of the spring or springs. The method of its operation is clearly shown in the accompanying drawing. When the spring is deflected from any cause, the belt is tightened up by the coil spring, which is fitted between two shoes, one of which is attached to the easing; and when the main spring recovers as the load is lifted, the strap pulls taut upon these shoes, the coil spring resisting the pressure and slowing down the action of the strap. The more severe the rebound, the greater the resistance of the strap.





A Mechanical Shoveling Device Handling Rock

MACHINE FOR HANDLING ORE AND ROCK

A new mechanical shoveling machine which can be used under a variety of conditions is being placed on the market by a concern in Knoxville, Tenn. Using almost any type of motive power, this machine is adapted for such special lines as loading coal or other material from the floor into pit cars, for the mining of ores and other materials in open trench work, to strip the soil from horizontal mineral deposits, to take the place of stock-house crews in blast-furnace work, to excavate rocks after blasting, and other similar work.

The machine, which may be operated by one man, is self-propelling in either direction at variable speeds. In operation, the shovel at the right end of the machine is forced under the material to be handled, by the forward movement of the entire machine, and when filled tilts back and discharges its load upon the conveyor.

PICKING FLOWERS WITH A SHOTGUN

The assertion that a shotgun is an efficient implement for the picking of flowers could with all justice be considered ridiculous, yet this was the means by which the famous botanists, Mr. and Mrs. P. Amaury Talbot, brought down many of the most valuable specimens gathered by them in Africa. They brought back to Eng-

land some 2,000 varieties of plants, of which about 10 per cent are expected to prove new discoveries, from an almost unknown part of Southern Nigeria, where scarcely a white man, and certainly no white woman, had penetrated before. Many of these specimens grew on trees, at such heights that the only way to secure them was by shooting them down.

COMBINATION ELECTRIC TOOL FOR GARAGES

A practical and handy combination electric tool for use in the private garage is shown in this drawing. Not only can it be used for drilling, but also for buffing, and for such home repairs as bench grinding for taps, dies and all kinds of edge tools; for lathe grinding, and for internal and external work. Its



A Handy Electrically Driven Combination Tool for the Private Garage

weight is only 10 lb., the motor develops $\frac{1}{10}$ hp., and the speed is variable between 2,400 and 4,000 revolutions per minute.

CA female draftsman has been admitted to the American Society of Engineer Draftsmen,



B eighteen Streams from High-Pressure System, Forming a Veritable Wall of Water

HIGH-PRESSURE SYSTEM IS CITIES' PROTECTION

High-pressure pipe-line service is being generally adopted by all large American cities. The latest to install this protection against fire is Baltimore, Md., where a system has just been completed at a cost of \$1,000,000.

The system in Baltimore embraces features that are novel, the chief one being the absence of fire plugs. At various places on the line of pipe are manholes, and the plugs, such as shown in the accompanying picture, are carried by the motor hose wagons. These plugs, each of which carries four con-

nctions for as many lines of 4-in. hose, are screwed to the feed pipe. A lever turns the water into the plug, and as each of the four connections has its own pressure regulator, it is possible to use four streams, each at a different pressure.

Some idea of the wall of water that can be formed for the protection of buildings can be gained by the other picture, which shows 18 streams concentrated during a test which was made May 20.



Plug of High-Pressure Pipe-Line System

PIER TELEPHONE LINES FOR OCEAN LINERS

Direct connection between transatlantic liners and the telephone system of New York, while the steamships are at their piers, is now being made possible by the New York Telephone Co. Coin-box telephones are installed on several of the liners, notably those

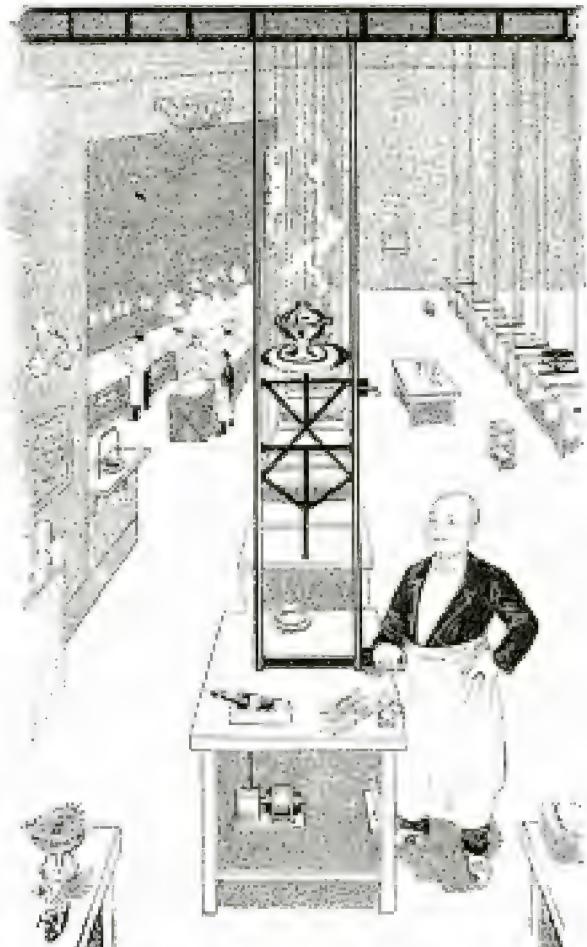
of the Cunard line, and when the vessels reach their piers representatives of the telephone company immediately establish connection with the shore service by plugging a flexible cable from a box on the wharf to another on board the ship. Passengers are thus enabled to telephone to friends before disembarking.

REMARKABLE ELECTRIC-SERVICE HOTEL

A remarkable hotel, every part of which will be operated by electricity, even to the serving of guests in the dining rooms, service in the rooms, and the opening and closing of windows, is to be built in Paris by M. Georges Knap, a well-known electrician whose wonderful electrical house near Paris was described and illustrated in this magazine a year or so ago.

The dining-room arrangement is clearly shown in the accompanying illustration. The kitchen is directly underneath it, and directly under each table in the dining room is a kitchen table from which rises the framework of an elevator which terminates in the top of the former. The bronze lamp standard of each table is fitted with a microphone-telephone, and the person giving the order simply speaks in the direction of this standard, and as soon as the dish ordered is ready it makes its appearance up through the center of the table on a silver tray. Used dishes are returned to the kitchen in the same manner.

Part of the ceiling of the reception or rest rooms and the bedrooms acts as a telephone transmitter. The guest, on awakening in the morning, only has to push a convenient button and speak his or her desires in the direction of the ceiling to obtain instant service. If it is a window to be opened or closed, this is accomplished in a few seconds after the request by electrical machinery, and if it is a cup of tea or coffee, or a complete breakfast or luncheon, this, too, will be forthcoming in short



Arrangement of the Electrically Served Dining Room of an Electrically Operated Hotel to be Built in Paris

order, the meal making its appearance on the top of a table placed conveniently beside the bed, so that the occupant need not rise.



Typical Chinese Gunboat, the Principal Duty of Which Is to Run Down the Pirates That Infest Inland Waters

CHINESE GUNBOATS

The type of Chinese gunboat pictured in the accompanying illustration is very common on the inland waterways of the coastal plain of China. The boat itself is almost identical with the ordinary cargo craft of similar size; although its lines are generally a little finer, to give it an increase in speed. Otherwise the gun in the bow and the blue and white striped awning are the only distinguishing features. The armament consists of a single smooth-bore muzzle loader, the bore in this case being about $2\frac{1}{2}$ in. On a peace footing there are about five men in the crew.

Nominally, these craft are for policing the smaller rivers, creeks, and lakes which are infested with pirates; actually, their principal duty is escorting and saluting higher officials. Some years ago when the viceroy at Hankau returned from a protracted visit to Peking, no less than 50 of these gunboats were lined up along the bank of the Yangtze to salute him. The only limit to the number of guns seems to be the supply of ammunition, for in this case the firing continued for several hours.

Usually, when not saluting, the boats tie up to the bank adjacent to the native village of the captain, where they remain until a case of piracy more flagrant than usual occurs, possibly involving a petty official who has been seized for ransom or robbed and caned. Then peremptory orders are sent out to the commander and captains of the fleet nominally patrolling the district in which the piracy occurred, to capture forthwith the offenders or to suffer disgrace. As a penalty is certain to be inflicted in case of failure, some prisoners are always produced, to be later beheaded. In the rare instances where a pirate is captured red-handed he is put to death by the "ling-chi" or one thousand cuts.

It is not often that the gunboats use their armament in attack; but occasionally they let fly at close range a charge of chilled cast-iron slugs, with results generally disastrous to the enemy.

©The placement of 97,751 cu. yd. of concrete at the Miraflores locks of the Panama Canal in April is a record, exceeding previous monthly records at any of the locks.

CUTTING DOWN PITTSBURGH'S "HUMP"

By HARTLEY M. PHELPS

At Pittsburgh, Pa., they are cutting down a hill that covers 15 blocks in the heart of the city. It is one of the most important improvements ever undertaken by an American municipality—certainly the most important ever started in Pittsburgh; for it means the removal of an impediment to the expansion of the business district eastward. This elevation, locally known as the "Hump" or Grant's Hill, has been the cause of one of the greatest congestions of business and traffic that ever afflicted a large city.

The hill extends in a north and south line across the peninsula on which downtown Pittsburgh is built, the waterways forming the peninsula being the



Fifth Avenue,
Pittsburgh,
with its
objectionable "Hump"

Monongahela and Allegheny Rivers, which unite a mile west of the hill to form the Ohio. Its greatest elevation or summit is 45 ft. or so above the plain below the hill; and the work now going on is the cutting down of the streets from 18 ft. to lesser depths, depending on the slope. Fifth Avenue, the city's main retail artery, passes over the hill at its greatest elevation and here, in front of the famous Allegheny County courthouse the deepest cut is being made. Work was started about the middle of April and is now well under way with steam

diggers and gangs of workmen.

The total cost is estimated at a million dollars. The contract for the excavating was let for \$671,000; and the ex-



Looking Down from Grant Street, Where It was Necessary to Blast Tons of Rock

pense of replacing sewers, water pipes, electric conduits, street-car tracks, etc., will exceed \$300,000. The public-service corporations are defraying part of the cost. The damages, if any, will be small, as more than 70 per cent of the owners of abutting property have signed waivers for the same. As a matter of fact, every foot of realty within the "Hump" zone will be benefited. The property owners will have to pay the expense of lowering their lots, but, fortunately, the substantial buildings within the zone were built with the cut in view. Among these are the magnificent Frick office building, 21 stories high; the Carnegie building; the Hotel Henry, and the superb courthouse, Richardson's masterpiece, which cost nearly \$3,000,000. The cut will vastly improve the courthouse, which will be above the new grades, whereas it now stands in a sunken court 10 ft. below the summit of the hill.

The present grade of Fifth Avenue on the hill is 7.44 per cent, that is a rise of 7.44 ft. to the hundred; but after the cut it will be an easy grade of half this. Grant Street, which runs north and south in front of the courthouse will be level. According to the engineers' estimates there are 143,000 cu. yd. of earth, including much rock, to be removed. The first shovelful of earth was lifted by Mayor William A. Magee with a silver spade which is now a relic of the improvement.

Owing to the fact that great inconvenience would be entailed to business men and owners of office buildings were the entire district to be torn up at once, only half of the work is to be done this year. Next year it will be completed.

Of equal importance with the paring down of the "Hump" is the comprehensive widening of important streets, which work is being carried on simultaneously. Oliver Avenue, Diamond Street, Strawberry Way and Cherry Way are being broadened and the fine Grant Boulevard is being extended to Grant Street, thus affording a direct route for vehicle traffic to the populous eastern parts of Pittsburgh. These improvements will vastly lessen the intolerable congestion that now makes the lower part of the city resemble the southernmost district of Manhattan, or the old part of Boston.

When the hill is cut down improvements to the value of \$30,000,000 or more are to be made. H. C. Frick owns three blocks on Grant Street, on one of which it is said the Pennsylvania Railroad is to build a magnificent downtown depot. The Hostetter estate is to erect a great skyscraper, and stores and office buildings galore will be built. At present most of the buildings on the "Hump" are of ordinary antiquated character. Real-estate values will be doubled and the improvement will undoubtedly pay for itself in a couple of years or so.

HIGHEST AND LOWEST POINTS IN UNITED STATES

The highest point in the United States is Mount Whitney, Cal., 14,501 ft. above sea level. Although at this great elevation perpetual snow might be expected to exist, the summit of the mountain is said to be invariably swept bare by the winds. Several years ago a survey was made from Los Angeles direct to the summit of the peak, and on its summit a special aluminum tablet was placed. The next highest prominent mountain in the United

States is Mount Rainier, Wash., also called Mount Tacoma, which is about 14,360 ft. This majestic peak is in large part a vast glacier, and as the apex of the mountain is a huge snowbank of unknown depth, but estimated to be from 60 to 70 ft. and varying from season to season, the altitude of the mountain is not constant. Its highest rock portion is probably at least 200 ft. below that of Mount Whitney.

By a curious freak of nature one can



Mount Whitney, Cal., 14,501 Ft. above Sea Level: the Top of the United States; the Summit of the Peak was Surveyed by George R. Davis, Topographic Engineer of the United States Geological Survey.

stand atop of Mount Whitney, the highest point in the United States, and look down, through the clear atmosphere, upon the lowest point in the United States, only 92 miles distant, but 276 ft. below sea level, a difference in altitude of 14,777 ft. This lowest point is three miles from Bennett's Well, which is a running spring of really good water, in Death Valley, Cal. The well is 10 ft. above the lowest

point of the most desolate and forbidding region in the country.

Death Valley was once, many thousands of years ago, a great land-locked lake; and its floor is now incrusted in many places with deposits of salt, borax, soda, potash, and other minerals, the most abundant of which were concentrated and deposited in beds when the ancient lake finally dried up. The famous 20-mule borax team oper-



In the Bottom of Death Valley, the Lowest Point in the Country, Showing the Old Road to Bennett's Well.

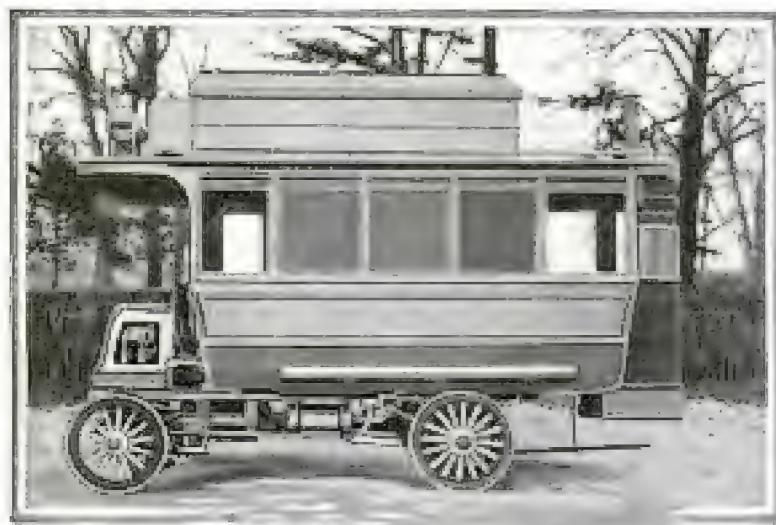
ators hauled borax from these deposits in the old lake bed for many years, and in fact are still mining borax in this desolate region.

It is a rather singular fact that throughout the great Rocky Mountain and Sierra Nevada systems in the United States, while there are a large number of very high peaks, several above 14,000 ft., and very many nearly

14,000, there is no one peak which stands out distinctively above all the others. In Mexico, Popocatepetl and Orizaba both rise above 17,000 ft., and in Alaska, Mount McKinley is 20,300 ft., while Mount Foraker, a sister peak, is 17,500 ft. high. Either of these Alaskan peaks would make the highest mountains in the United States proper, great as they are, appear small.

OLD BUS IS CONVERTED INTO CARAVAN

An Englishman who enjoys long wandering trips along many quiet by-ways of rural England has provided



This Motor Caravan, Consisting of a Chassis of About the Year 1902, Provided with a Body of an Old Horse-Drawn Omnibus, was Put Together by an "Open Road" Enthusiast for Use in Rural England

himself with a somewhat unusual caravan in the form of a motorbus. The chassis is a 12-hp. Milnes-Daimler, of about the year 1902, upon which was placed the converted body of an old horse-drawn omnibus which spent its youth and middle age in traveling London streets.

In a boxlike addition at the rear of the omnibus body is a kitchen range, which, in addition to its use as a cook stove, serves to warm the interior of the caravan. Coal is kept in a box beneath the range, and a long box on the roof serves to store the camp outfit.

EFFICIENCY ENGINEERING FORTY YEARS AGO

A method of utilizing racial pride as an aid to efficiency, practiced 40 years ago in the building of a large banking house in Philadelphia, is described by a correspondent of Engineering News. The rate of hod-carrying up ladders for three stories was raised to a maximum in this way: The trick was to find a negro with a good sound heart and a first-class pair of lungs, on a stout pair of legs. This darky was paid \$5 a day at a time when the other hodcarriers got \$2.50.

But the condition on which he worked was that he should break the record and lead the line up the ladder. The rest of the line in that day were Irishmen. Therefore, they hated a darky and on general principles asserted the superiority of the white man. They had to be consistent to their assertions and principles. The result was a stream of brick-laden humanity mounting up those ladders with a celerity not to be beaten by the methods of a modern efficiency expert.

The Chinese name for their new Republic is "Chung Hua Min Kuo" which, translated, is Middle Flowery People State.

OIL-WELL GAS LIQUEFIED FOR CONSUMPTION

A new liquid gas now being placed on the market is prepared from "heavy" natural gas, particularly the waste gas which accumulates in the pipes of oil wells. This raw product is a waste material, never utilized until the present. To prepare the new liquid gas, the natural gas is compressed and cooled, and the heavier parts which condense are separated. The lighter parts are next condensed, and are forced under pressure into a vessel called the "rectifier," where they come in contact with coils containing superheated steam, and are completely vaporized. The gases then pass in succession a series of coils, each heated to a somewhat lower temperature than the preceding one; and these coils separate the gases, by a selective action based upon the critical temperature of each gas, into a series of products. The gas, methane, so obtained is used to operate the gas engines which are used in the compression of the gas, and the other gases are liquefied for heating and lighting purposes. This liquid gas is a perfectly transparent liquid, which remains in the liquid form when under

One volume of liquid produces 350 volumes of gas, and the heating power

Storage Tank of Liquid Gas Housed on Outside of Building



Suitcase Portable Apparatus for Using Liquid Gas in Reading Lamp

a pressure of 500 lb. to the square inch, changing to gas under less pressure.

of this gas is claimed to be four times that of coal gas.

The ordinary house tank for the storage of the liquid gas is about 52 in. high and 8½ in. in diameter. It may be placed in a housing located just outside the building, as shown in one of the illustrations, and holds the equivalent of 2,000 ft. of ordinary city gas. By means of a reducing valve the liquid from the cylinder changes to gas at a pressure just about the same as that used in the ordinary gas systems for house lighting.

A woman in Boston, Mass., received word one day that her brother was dead and a week later was startled to see his face and figure shown prominently on a moving-picture screen during the course of a show that depicted scenes hundreds of miles from any point she had ever known her brother to visit.

THE U. S. S. "ARKANSAS" IN DRYDOCK

The enormous bulk of the super-dreadnought "Arkansas," one of the latest additions to the U. S. Navy, is



The U. S. S. "Arkansas" Tested the Capacity of the Drydock at the League Island Navy Yard

here shown at the League Island Navy Yard, where she was towed to be painted and finished. The big vessel was docked with difficulty, and little room remained at the sides of the dock when she was finally warped in.

In London one of the important attachés of a prominent theater is a young woman, "the whisper girl," whose business it is to receive telephone calls for the patrons of the show, thus saving them the annoyance of leaving their seats unless it is absolutely necessary.

PLOWED FIELD AS HIGH-VOLTAGE CONDUCTOR

One of the large hemp-center stranded copper wires of the Central Colorado Power Co.'s 100,000-volt transmission line broke recently, allowing the two ends to fall to the ground in a plowed field. The time the break occurred was one o'clock in the morning, and the system was carrying 3,700 kw., but the ground connection thus established continued to carry the load without incident for several hours, according to the Electrical World Magazine. During this period one of the wires finally burned back to the point where it hung suspended from the tower, thereby setting up a series of arcs between wire and ground and causing surges which attracted the attendant's notice by the swinging of the station-instrument needles. When the trouble was located the stranded conductor between the towers was found in the shape of a number of short sections averaging 6 in. in length, and below the end of each was a cone-shaped formation in the clay soil, where

the earthy matter had been fused to a mass of slag. As each section of conductor burnt off, the live end left had apparently established a new point of contact, about 6 in. from the end, where it was in turn severed. Some of the slag masses or fulgurites measured 6 in. in diameter at the top, tapering to 2 in. at the tip, 18 in. below the ground, and the surface of each was covered with numerous little spines or roots, apparently marking the points where the current entered the surrounding earth. In other places the fused mass lay in the direction of the

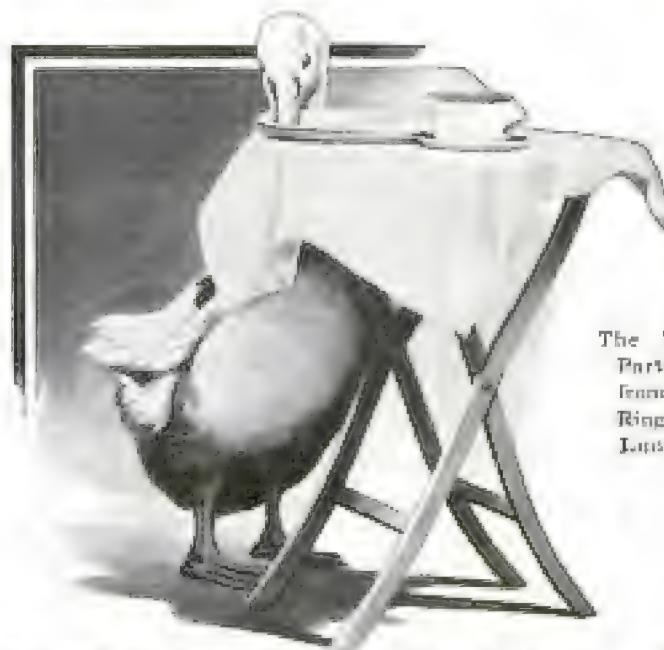
line, and for several feet around this the ground was too hot to stand upon, even three hours after the current had been shut off.

Since the accident the field has been replowed, bringing to light numerous sections of the once molten, glassy path which joined the conductors.

BRIGHT GOOSE TRAINED TO DO TRICKS

A trainer of birds and animals in London has trained a goose to a degree of cleverness said to be truly remarkable. The owner explains that al-

Last January the Roads Improvement Association complained to the Board of Trade, alleging that the municipal tramway cars obstructed the streets. After careful investigation as to the relative number of passengers carried by busses and tramcars, the committee found that more passengers used the cars than rode in the busses; and, in fact, that the cars were capable of handling more than the busses. The report states that, as there was ample accommodation for the passengers in the cars, and these were in operation before the busses on the same routes, it is the latter that obstruct the streets.



The Trained Goose Partaking of Lunch from a Table and Ringing the Bell for Luncheon



though he has been teaching tricks to birds and beasts for the past 30 years, this is the first intelligent goose he has found. It accomplished all the usual tricks taught to animals for exhibition purposes, such as picking out cards, counting, ringing the lunch bell, taking the contents out of baskets, etc.

MOTOR BUS VS. TRAMCAR IN LONDON

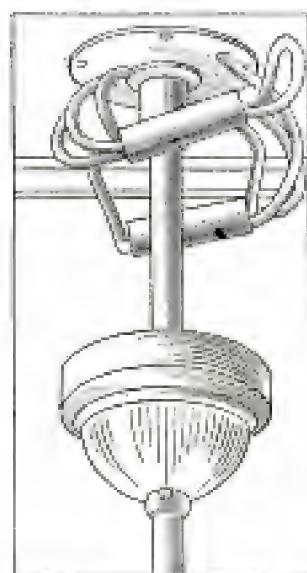
Motor omnibuses will not entirely supplant the electric tramcar in London for some time, if a recent report of the Highways Committee of the metropolis, which considers both forms of transportation, receives due consideration from the British Board of Trade.

The enormous vehicle traffic of London's streets is indicated in the report. To obtain necessary information, observations of bus traffic were made between 9 a. m. and 5 p. m. at busy centers. At Charing Cross, Piccadilly and Oxford Street 5,480 busses were noted, an average of 685 an hour. The average number of passengers in each, however, was only 10.97. The report suggests that the association's charge that the tramways run too many cars applies equally to the bus companies. In practice, it is said, the council operates, between 10 a. m. and 4 p. m., only 69 per cent of the number of cars running morning and evening. If electric cars were entirely withdrawn, says the report, and the same seating capacity

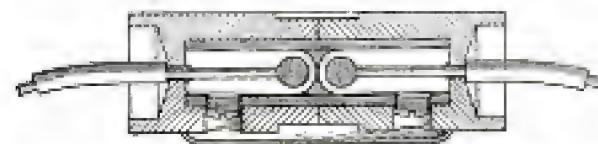
had to be provided by busses as is now furnished by the cars, 2,688 busses, or an increase of 114 per cent, would be required during fine weather, while during inclement weather, when only inside seats could be used, 5,712 busses, or an increase of 351 per cent, would be required.

NEW ELECTRIC-WIRE CONNECTOR

An electric-wire connector, which eliminates the necessity of soldering and winding tape on joints in electrical installation and fixture wiring, is shown in the accompanying illustrations. The interior construction of the device, which is 2 in. long and $\frac{5}{8}$ in. in diameter, is clearly shown in one of the drawings, indicating how each wire is



wedged into place. The loosening of two screws is all that is necessary for



Interior Construction of New Electric-Wire Connector

the removal of a fixture connected up by it.

COOLING POWDER MAGAZINES ON FRENCH WARSHIPS

Earnest attention has been given by the French naval experts to maintaining a pleasant, moderate temperature in the powder rooms of the two latest French battleships, owing to the awful lesson of the explosion of the battleship "Liberté" which was believed to be at least in part due to too high tempera-

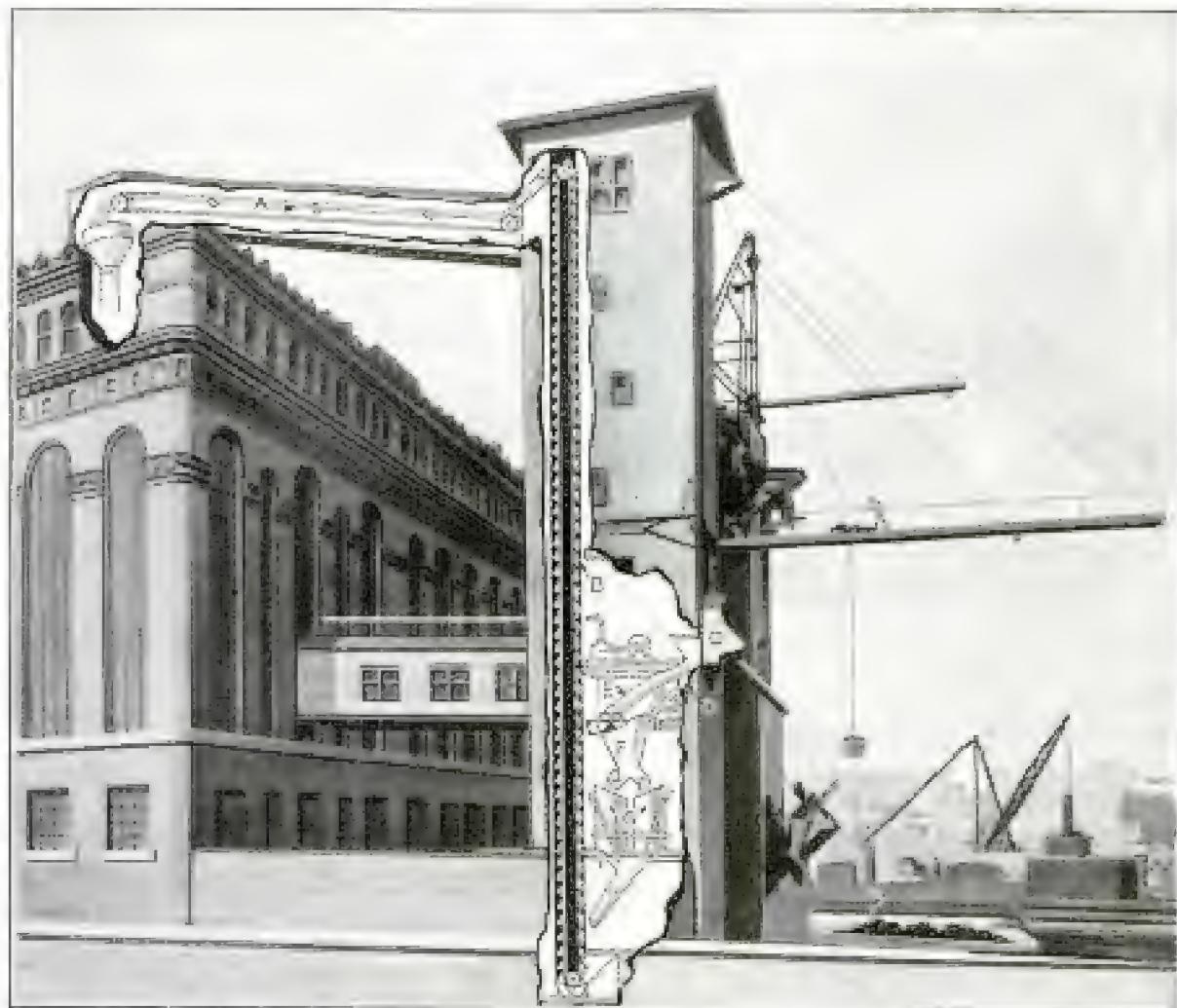
ture in the magazines. A simple, light-weight, easily maintained refrigerating apparatus has been adopted, which the designers believe to be far in advance of other systems for this purpose. It is a development of the Leblanc system, the cooling resulting from the rapid evaporation of a fine spray of water when a current of air is passed through it. The more rapidly the vapor is drawn off, the more cold results, and in these model systems four electric rotary pumps draw off the vapor at an exceedingly high rate. The machines weigh only half as much as carbonic-acid machines of equal efficiency; they do not need a constant supply of chemicals, which might be difficult to obtain under war conditions, and they operate with practically no noise.

NATURE OF GLARE FROM WHITE PAPER

An analysis of glare from paper is made by a writer in the Electrical Review and Western Electrician. It is well known, he says, that glare in any of its forms diminishes the effectiveness of an illumination. We are able to see printed letters because of the contrast between the dark letters and the bright background. The reflection from commercial papers is a combination of diffuse, or widely spread out, reflection and specular, or mirror-like, reflection. The greater the amount of diffusely reflected light compared with the specularly reflected, the less is the annoyance from glare.

Those who have difficulty in forming an idea of these two kinds of reflection can construct a model of a semidiffusing paper by placing a clear, plane sheet of glass over a white, mat surface, such as a blotting paper. The glass will reflect specularly, while the blotting paper reflects diffusely.

A new product of seaweed, "nor-gine," used for softening textile goods, is being manufactured in Norway. It is made from kelp, which consists of the ashes of the seaweed *Laminaria*.



Courtesy Engineering News

Combined Coal Unloader, Crusher, Weigher and Elevator. A, Belt Conveyor; B, Bucket Elevator; C, Hopper; D, By-Pass Chute; E, Feeder; F, Flap Gate; G, Weighing Hoppers

COMBINATION COAL DOCK, ELEVATOR AND CRUSHER

The coal dock of the New York Railways Co., New York City, has an interesting system of taking fuel from barges, and crushing, weighing and delivering it to conveyors in the monitor of the power house, 138 ft. above the ground. The boom of the hoist is at a height of 60 ft., and between this elevation and the ground is a collecting hopper, a crusher, and the storage and scale hoppers. The coal, after discharge from the grab buckets, which take it from the barges, passes through a descent of about 40 ft. in which it is crushed and weighed. Then the endless chain of buckets elevates it 120 ft. to an inclined belt conveyor, which delivers to the conveyors in the power house.

ALCOHOL FOR HEATING NEW FREIGHT CAR

Denatured alcohol is the fuel used to heat a specially constructed freight car, manufactured by a Chicago company. The heating apparatus consists of a fuel-supply tank underneath the car equipped with special burners, the heat from which is carried by longitudinal ducts under the floor of the car and at its end ascends to the roof. In this manner the heat is circulated uniformly throughout the car.

A new electric lamp with a filament so closely wound that it resembles a mantle for an incandescent gas lamp has been successfully tested in the French lighthouse service.

STONE BRIDGE REINFORCED WITH CONCRETE

A stone arch bridge on the Chicago & Alton Railroad between Alton and Jerseyville, Ill., having been con-

structed for much lighter traffic than at present, began to break at the narrowest portion of the piers. The upper portions of the arches, however, were in good condition, and repairs were made by plac-

ing steel bands around the piers and reinforcing with concrete in the manner shown. The bases of the concrete reinforcing are 8 ft. below the surface.



Stone Arch Bridge on Chicago & Alton Railroad before Repair



After the Steel Bands Had Been Placed and Concrete Built Up around Each Pier



Hand Loop on Eye of Mooring Cable, Designed to Protect the Sailors from Injury

HAND LOOP FOR MOORING-CABLE EYES

The Pittsburgh Steamship Co., which operates 106 big freight boats on the Great Lakes, has equipped all the wire-cable mooring lines used on these vessels with a hand loop, the purpose of which is to prevent the sailors from losing fingers while dropping the lines over dock piles. A small loop of $\frac{1}{2}$ -in. cable is attached to the end of the mooring eye in the manner shown. Previous to this arrangement the men had to take hold of the sides of the eye and often got their fingers caught between the pile and the cable.

Less than 3 per cent of the land in Norway is under cultivation; 25 per cent is covered with forests and the remainder consists of moors, mountains, lakes and marshes.



A Reproduction from a Photograph Taken with a Camera in Which a Very Small Hole was Used to Admit the Light for Exposing the Plate

MAKING PICTURES WITHOUT CAMERA LENS

Over 300 years ago, Porta, an Italian naturalist invented the camera obscura in which a pinhole played the important part in producing nature pictures on a screen. Not until Daguerre perfected the process of fixing the pictures to make them permanent did the camera come into prominence.

While the pinhole was the forerunner of the lens, its use in making photographs was overlooked until artists and photographers realized that there are no pure blacks or whites in nature, that the eye does not see the nearby object and the distant village at the same time with equal sharpness, and they agree that a sharp definition is not necessary, in fact would be inartistic. Considering these facts, instead of using the modern anastigmat lens, the pinhole produces the picture desired with a dif-

fusion of focus and an equal softness. The only purpose of a lens, then, is to obtain speed. The pictorial lens now so popular is one with which it is impossible to obtain a sharp focus and for this reason the pinhole process can be made to answer the purpose of the modern lens in many instances.

The illustrations, showing the Field Columbian Museum and the Japanese buildings in Jackson Park, Chicago, were made with an exposure of one minute, the focal length being about 4 in., in a box with

a pinhole substitute for a lens, which is illustrated in Fig. 1. The box was made with inside dimensions $\frac{1}{4}$ in. larger than a 5 by 7-in. dry plate, and a focal length of 4 in. The back of the box swings on hinges and a hook hasp holds it against the box end. The box is not hard to make and the



A Picture Which was Made with an Ordinary Box of About 4 in. Focal Length, Using a Pinhole Substitute for a Lens

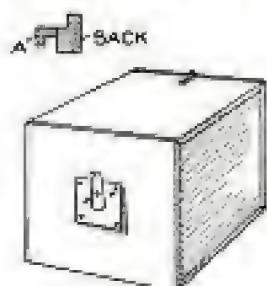


FIG. 1

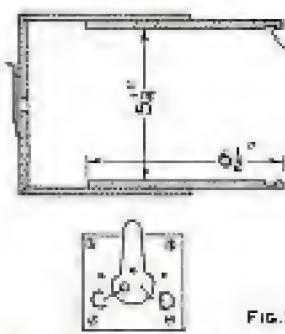
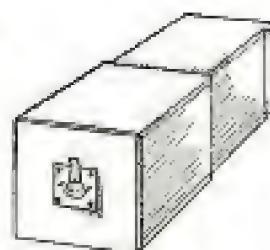
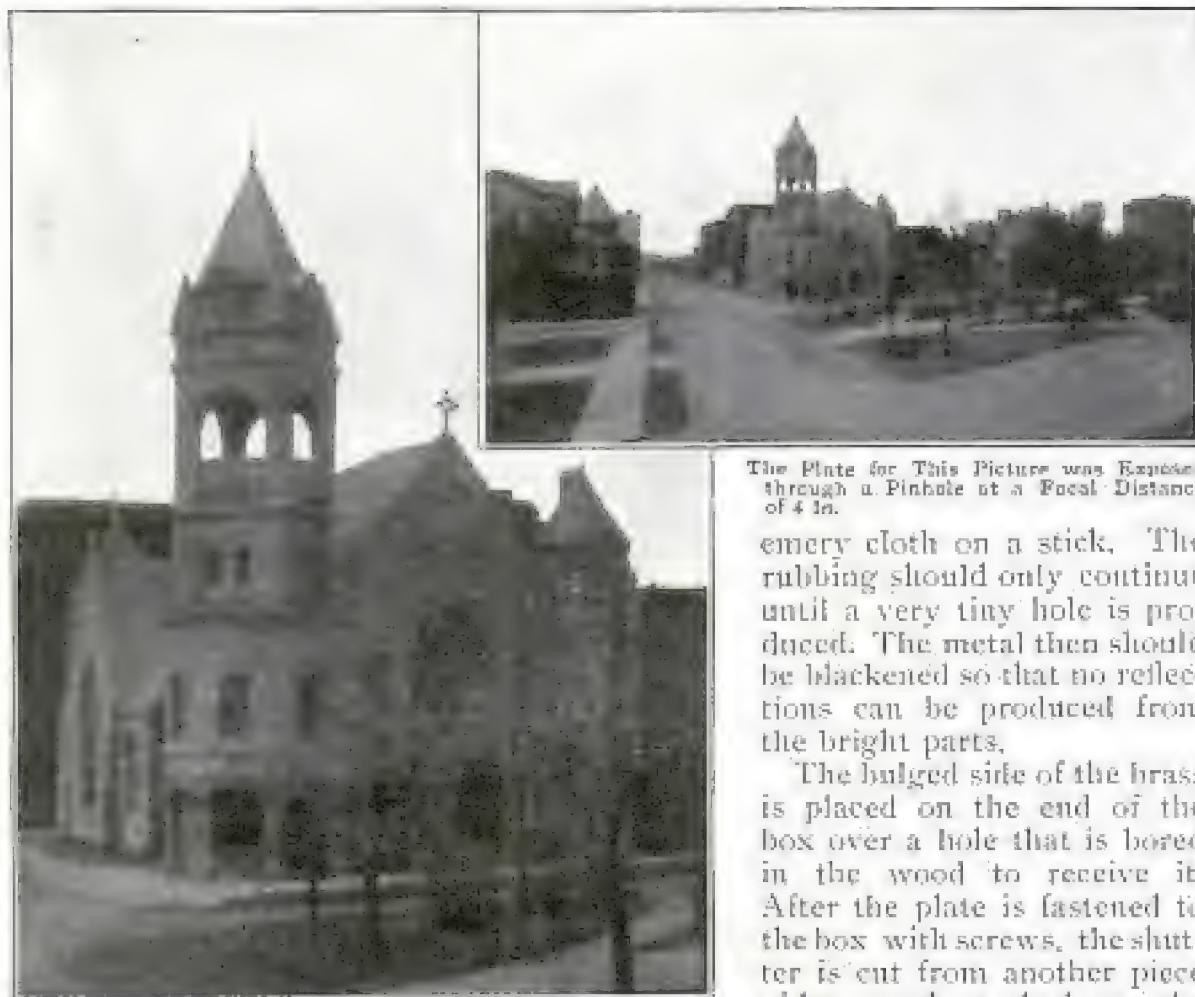


FIG. 2



Two Forms of Home-made Boxes, One with a Fixed Distance and the Other Telescoping, Used to Make the Photographs Reproduced in This Article



The Focal Distance in Producing This Picture was 13 In. The Two Pictures, Taken from the Same Distance, Show the Relative Sizes Obtained with Different Focal Lengths

only essential part is to have it perfectly light-tight and coated on the inside with a dull black paint. In this instance the plate was put in the box in the dark room and fastened with thumb tacks at each corner. A better way would be to fasten small pieces of wood with hot glue to the inside hinged back cover as shown at A, Fig. 1, to make grooves for the plate.

The pinhole was made in a 2-in. square piece of brass on which a shutter was mounted to swing easily on a screw. The pinhole, which is the essential part, can be made by locating the exact center of the brass and driving a very sharp-pointed instrument into the metal, not to puncture it, but to make the metal bulge a little on the opposite side. This bulge is cut through by using a very fine stone or

The Plate for This Picture was Exposed through a Pinhole at a Focal Distance of 4 In.

emery cloth on a stick. The rubbing should only continue until a very tiny hole is produced. The metal then should be blackened so that no reflections can be produced from the bright parts.

The bulged side of the brass is placed on the end of the box over a hole that is bored in the wood to receive it. After the plate is fastened to the box with screws, the shutter is cut from another piece of brass and attached over the pinhole, as shown, so that it will swing easily yet not too freely.

As stated before, the plate is placed in the box in the dark room, the shutter closed and the camera taken to the object to be photographed. The process of setting the camera and making the exposure is similar to using an ordinary box camera.

To go into this work deeper, a camera shown in Fig. 2 can be constructed which will give the operator a chance to do considerable experimenting. The illustration of the church was made with a pinhole for a lens, the camera being at the same distance from the edifice in both exposures. This illustrates that the reversed picture thrown on the screen can be changed in size by a difference in the focal length. The smaller picture was taken with a focal length of 4 in. while the larger one was made with this distance being

13-in. The definition is not so good in the long focal length as in distances of from 4 to 6 in. The exposure for the 4-in. focus being 1 minute and for the 13-in. focus twice as long.

The construction of this camera can be more elaborate. Grooves may be cut as shown at B to hold a plate holder. A spring clip is attached in the upper and lower part of the box to hold the plate holder tightly against the front part of the groove. The use of a plate holder makes it desirable to use a ground glass. Such a glass can be easily mounted in a frame which has the same outside dimensions as the plate holder and is inserted in the same manner. The use of a plate holder gives the operator the same privileges as if using an ordinary hand camera. The camera is made of two boxes, one to fit in the other so that they will telescope and produce a varying focal length. The construction of the front box is very similar to the first with the exception of the back, which is left off to receive the smaller box and then the back is placed on the latter in a similar manner, or grooves

made as described to hold the plate holder.

The pinhole for the latter described camera is made in the shutter part and a much larger hole is drilled in the center of the plate. The shutter in this instance has two holes, the one at C is $\frac{1}{16}$ in. in diameter and is used in setting the camera and finding the focal length for the size desired. The other one, D, being the pinhole. After the camera is set, the shutter is left central, which covers the large hole in the plate. The lower part of the shutter is moved to the left, which brings the pinhole over the hole in the plate to make the exposure. On either shutter pins are located for stops to keep it from passing too far over the hole in the plate, and care must be taken to have the shutter carrying the pinhole so adjusted that it will not move from any slight jar after it is set for making the exposure.

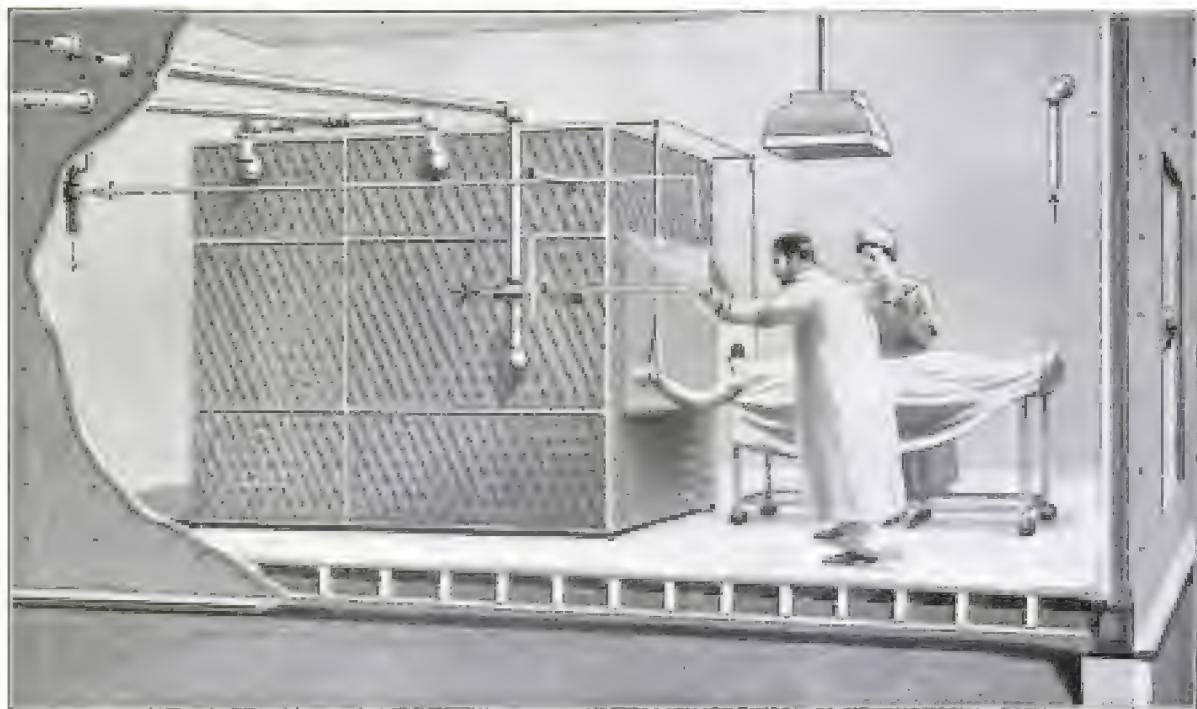
The pinhole may not be a satisfactory substitute for the modern highly developed photographic objective, yet very interesting and unusual pictures can be obtained with it.

APPARATUS FOR PERFORMING OPERATIONS ON THE CHEST

The development of surgical skill under the modern aseptic or clean method has enabled the surgeon to invade many cavities and attack many organs of the body which were hitherto forbidden ground. The chest cavity may now be opened for the removal of collections of pus, to remove foreign bodies, to open abscesses in the lungs, to close up wounds or to remove gangrenous or even tuberculous portions of the lungs. It is found, however, that if the chest wall of a living being is opened by an incision sufficient to permit the entrance of the outside air, which has a pressure of about 15 lb. to the square inch, the lungs collapse and the being dies. This can be overcome by making the pressure to which the open thorax is exposed less than that of the air

breathed, and extensive operations on the lung may then be made by placing the head of the patient in a chamber in which a pressure above that of the surrounding atmosphere is maintained, or by placing the body in an atmosphere of lessened pressure. Both methods have been employed by means of air-tight cabinets in which either the head or the body of the patient is placed. Some of these have been so constructed that the surgeon was required to remain on the outside of the cabinet and operate with his hands thrust through protected openings in the sides of the cabinet, watching his work through a glass window.

W. and J. Meyer, surgeons of New York, have devised and patented a cabinet employing either positive or negative pressure, or both at the same time,



Modern Air Cabinet and Operating Air Chamber, both Contained in an Ordinary Hospital Operating Room, to Enable Surgeons to Vary Air Pressures on Different Parts of the Body of a Patient Undergoing an Operation on the Lungs.

of sufficient size to permit the anesthetist, the surgeon and his assistants to be inside during the whole operation. It consists of two chambers, one for the body of the patient, which rests on an ordinary operating table, the surgeon and his assistants, and another smaller chamber into which the head of the patient projects, with a shutter closing around the neck of the patient and preventing the interchange of air between the two chambers. The anesthetist also sits in this chamber, to which air is conveyed through a pipe by means of an electric pump, any desired pressure being maintained by means of a valve to which is attached a gauge. This is a positive-pressure chamber, and is perfectly ventilated at all times.

The operating chamber has connected with it a system of pipes and valves and a suction pump, which reduces the air pressure below that of the atmosphere, to any desired degree, as shown by a gauge. This chamber is also perfectly ventilated at all times. The operation can be done under negative pressure in the operating chamber, or under positive pressure in the anesthetizing chamber; or both may be

used at once, and the collapse of the lungs prevented perfectly until the chest wall is closed. The cabinet is made of a framework of angle-iron, wire screen and copper sheeting, with a wood and cement floor, and has an air lock connected with the anesthetizing chamber lined with rubber or other airtight material. A window between the operating chamber and the anesthetizing chamber enables the surgeon to watch the face of the patient during the operation.

SEAWEED AND CABBAGE TURNED TO RUBBER

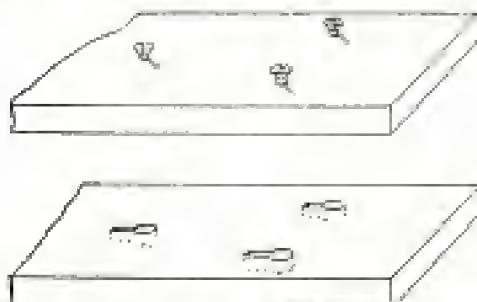
A substitute for rubber, the base of which is seaweed or other marine plants, has been patented by an English inventor. The process involves boiling the seaweed in ammonia, after which is added oil with a glutinous or resilient binding material, the whole being agitated while in a heated condition. The substance has the characteristics of rubber and is capable of partial or complete vulcanization. In addition to or in place of the seaweed other vegetable matter may be added, such as tree or cabbage leaves.



Joining Boards without Glue

Some climates will not permit the use of glue in fastening wood surfaces together. Sometimes, also, glue is not available. In either case, the two surfaces may be readily and securely joined with screws as shown in the sketch. The screws are turned into one surface, allowing a certain portion of them to project. The heads of all the screws should be an equal distance above the surface.

Turn the piece over and place the heads on the other surface and strike lightly with a hammer to mark the location of each screw. Bore a hole on each mark to receive the screw head. Cut a slot from each hole, the



The Projecting Screw Heads When Driven into the Slots Draw the Surfaces Together

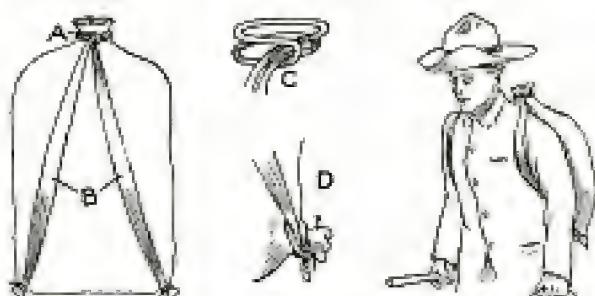
size of the screw shank, and all in the same direction.

Place the surfaces together with the heads of the screws in the holes and strike one or the other piece in the right direction endways to drive the screws into the slots. This will draw the surfaces very closely together.—Contributed by William R. Newbold, Empire, Canal Zone.

A cutting-off tool should not be set by guess—use a square.

An Emergency Pack Strap

The pack strap can be made of an old sack, strong cloth or a piece of rope. If a rope is used, it should be



Pack Strap as It Is Attached to a Pack and Slung on the Shoulders for Carrying

fitted with a pad to protect the shoulders. A loop is made in the center of the strap, as at A, the ends B being long enough to tie at the bottom corners of the pack. The loop at A is more clearly shown at C, and the bottom corners are tied as shown at D after placing a rock inside each. The pack is easily carried on the back as shown.—Contributed by W. A. Lane, El Paso, Texas.

To Take Up Slack in Wire Fences

When the wires of a fence become loose, they may be successfully tightened without taking them from the posts, in the following manner:

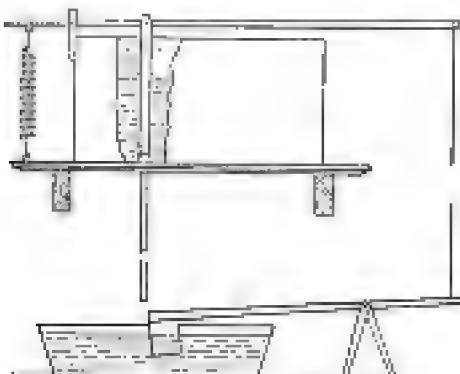
Use an ordinary monkey wrench and close the jaws to easily slip over the wire. Slip them on the wire and pull down as when turning a nut until a bend is made in the wire as shown. Make as many such bends as is neces-



sary to tighten the wire sufficiently. Do not make the kink too short. This is a very handy way to stretch wires around flower beds or small places where a stretcher cannot be used.

Watering Tank for Fowls

From a tank placed on a bracket shelf near the ceiling of my chicken house I ran a $\frac{1}{2}$ -in. pipe down and



Automatic Opening and Closing Valve on a Supply Water Tank for Fowls

into the water dish. I then made a float of a tin can and attached it to the end of a lever with the float resting in the dish in such a position that an increase of the amount of water would cause the float to rise and produce a downward motion of the opposite end of the lever. To this end I attached a cord which extended to a lever above the water tank, operating a cock valve at the top of the feed pipe as shown in the illustration.

A coil spring holds the valve open when the water in the watering dish is low and allows the water to flow in until the float rises, which closes the valve and shuts off the flow until the water is again lowered in the dish.—Contributed by Patterson D. Merrill, Chicago.

Removing Snags from a Sand Beach

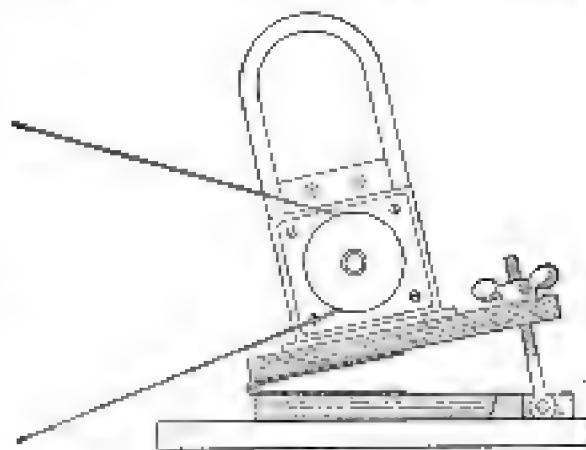
One of the difficulties which the caretakers of a bathing beach encounter is the removal of snags, such as large tree branches or trunks, and timbers which become deeply imbedded in the sand during storms.

To lift out a snag, a block and tackle

is hitched to it and to the top of a small tripod constructed of timbers. With the aid of one or two men, small branches and timbers that are not too deeply imbedded can thus be easily removed. For larger branches and whole trees it is necessary first to loosen the sand around the buried parts. This loosening is accomplished by means of a stream of water pumped from the ocean or lake by a portable pump driven by a gasoline engine. A hose leads from the pump to a 10-ft. piece of 1-in. or $1\frac{1}{2}$ -in. pipe, which the operator pushes into the sand. As the water issues from the end of the pipe, it loosens the sand so that the pipe can be pushed down to its full depth, if necessary. After the water jet has been applied in a sufficient number of places, the snag is hauled up by means of the block and tackle.—Contributed by J. J. O'Brien, Buffalo, N. Y.

An Adjustable Base for a Magneto

The illustration shows a simple method of mounting a magneto, bilge, air pump or any other small machine that is belt or friction-driven. The arrangement of the device makes it possible to take up any slippage of pulleys, etc., without cutting and splicing



The Base Consists of Two Pieces Which are Hinged, and Adjusted with a Bolt Having a Thumb Nut

the belt, or stopping to reset the magneto.

One of these devices was attached to an air pump for supplying pressure to automobile tires, and a number were

put into boats for magnetos, all of them giving entire satisfaction.—Contributed by H. R. Read, Brooklyn, N. Y.

Securing Pure Water from an Open Well

Where it is necessary to draw drinking water from an open well or spring, pure water can be taken from beneath the surface in the following manner:



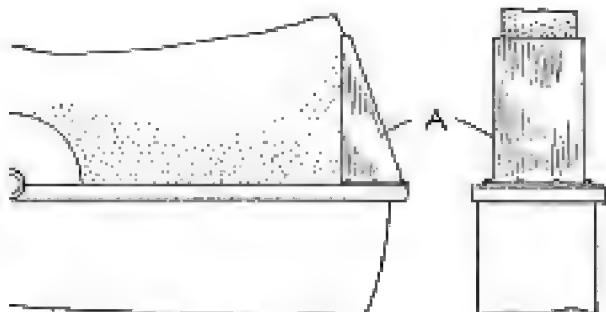
Insert a cork in a bottle in an inverted position, as shown in the sketch, having first attached a stout cord, A, to it. A weight is then swung to the neck on the outside as shown. Attach another stout cord, B, to the neck and lower the bottle into the water by holding the cord A. After the bottle has entered the water far enough, change the

hold from cord A to B. The water pressure will push the cork into the bottle and this will be filled with water. The bottle is then raised with the cord A.

This method not only secures pure water, but water that is quite a little cooler than if obtained at the surface.—Contributed by George Anderson, St. Paul, Minn.

Water Guard for a Grindstone

A grindstone that rotates with a small part of its lower circumference immersed in a reservoir or basin for



Guard Attached to the Grindstone Frame to Deflect the Water Back into the Pan

the purpose of moistening the stone, has a tendency to pick up the water and throw it in the direction in which the stone is turning. The larger the stone, the greater the amount of water thrown out, and the result is an unsightly and unsanitary floor, besides being an annoyance and inconvenience to the man who attempts to grind tools on that side of the stone.

The accompanying sketch shows a pyramid-shaped guard, A, that can be secured to the framework of the shaft. The upshooting water encounters it and is deflected back and down into the basin below. The guard's shape is such that it is not in the way of anyone working on that side of the stone. It is constructed of galvanized iron or heavy tin.

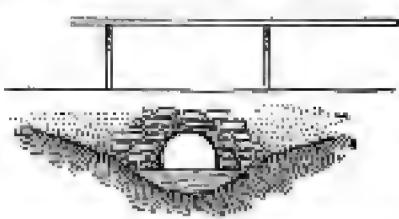
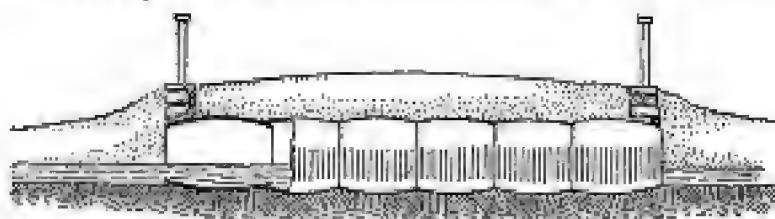
Inexpensive Temporary Culvert

A temporary culvert can be made of old oil barrels or beer kegs at a very low cost. Contractors and farmers are often in need of such a culvert that is only required for a short time.

The top end of each barrel is cut off

so that the bottom end of one barrel will slip into the top of the other about 4 in. The bottoms are knocked out after cutting the top ends off. The barrel laid in last requires no cutting.

The bottom of the trench should be



The Barrels are Slightly Telescoped and Nailed to Hold Them in Place until the Filling is Put on Them. The Ends of the Culvert are Built Over with Rocks to Hold the Filling.

made rounding to allow the barrels to fit in tightly, whereupon these are put into place, one by one, and nailed. Earth should be carefully filled in on the under side where the barrels are joined together so that pressure from above may not cause leaks, and the filling on top should be well tamped. If a 2-ft. filling is provided above a culvert made of ordinary beer kegs, heavy traffic can pass over it without causing any damage.—Contributed by Geo. Kanzler, Elizabeth, N. J.

Lengths to Cut Material for Making Bands

Some blacksmiths cut bands by three times the diameter, which is not correct, as the circumference is about 3.1416 times the diameter. The fractional part is impossible to determine definitely, but the following method makes the cutting of the bands sufficiently accurate for all practical purposes, and is easily accomplished.

Use a board 10 in. wide and 30 in. long, which is made smooth to receive the lines. Erect a right-angle

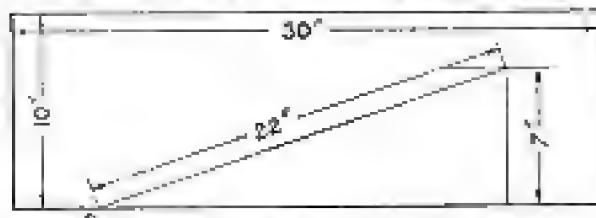


FIG. 1

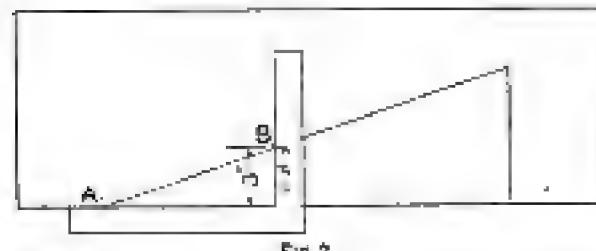


FIG. 2

The Board with the Right-Angle Triangle and the Measurement for a 7-Inch Band

triangle from one edge of the board which is used for the base, the hypotenuse being 22 in. long and the perpendicular 7 in. high, as shown in Fig. 1. A circle with a diameter of 7 in. has a circumference of approximately 22 in., as $3.1416 \times 7 = 21.9912$ or almost 22 in.

The length of iron to make a band of any given size can be found by laying the steel square on the board with the short leg across the hypotenuse line, as shown in Fig. 2, when the length from A to B will be the circumference. For example, suppose a band with a diameter of 3 in. is required. Set the 3-in. mark on the square on the hypotenuse as at B. Cut the metal the length from A to B and it will make a band 3 in. in diameter.

Tires may be cut by reducing the diameter of the wheel to inches. If a tire for a 4-ft. wheel is required, place the square as if to cut a band for a 6-in. diameter. This will be the length for one-eighth of the tire without allowance for the weld. The weld will require three times the thickness of the metal, which therefore must be added to the total length of the band.—Contributed by T. M. Anderson, Litchfield, Ky.

How to Cement Celluloid

It is not generally known that the method used by manufacturers of celluloid novelties for cementing celluloid pieces together or for cementing paper to celluloid, consists in wetting the two surfaces to be fastened together with wood alcohol and applying pressure by means of a weight.

The method is used for attaching celluloid protecting covers to labels used in small brass frames on drawer fronts to show the contents. The celluloid is not discolored by this method of cementing, and any marks or inscriptions underneath are plainly visible.—Contributed by J. H. Harmon, Pittsburgh, Pa.

To Preserve Putty

Putty, when left exposed to the air, will soon become dry and useless. I have kept putty in good condition for more than a year by placing it in a glass jar and keeping it entirely covered with water.—Contributed by E. H. Evans, Dorchester, Mass.

How to Make an Electric Soldering Iron

By R. A. McCLOURE

When a current of electricity is sent through an electrical conductor, there is a certain amount of electrical energy expended in causing the current to pass through the resistance offered by the conductor. The electrical energy expended, in forcing the current through the conductor, is converted into heat energy and will heat the conductor. The amount of energy expended in this way will depend upon the resistance offered by the conductor, the current that exists in the conductor, and the time the current exists. Electrical energy is measured in a unit called the "joule," and the number of joules of electrical energy expended in heating the conductor, in any given number of seconds, is equal to the product of the resistance of the conductor in ohms, the current in amperes squared, and the time in seconds. This statement put into the form of an equation would read as follows:

$$\text{Joules} = \text{amperes}^2 \times \text{ohms} \times \text{time in seconds.}$$

If all the heat generated in a conductor were retained by the conductor, its temperature would continue to rise indefinitely, but on account of the conductor losing some of the heat generated in it, its temperature will only rise to such value that the rate of giving off heat is equal to the rate at which heat is generated. If the conductor be wound around a piece of metal, the metal will be heated when there is a current in the conductor, the heat generated in the conductor being transmitted to the piece of metal.

The electric soldering iron consists of a piece of copper with a suitable winding placed about it and insulated from it, through which a current of electricity can be passed. The resistance of this winding should be of such a value that an excessive current will not exist in the winding when it is connected to the source of electrical energy. The power, in watts, needed

to operate the coil will depend upon the voltage of the source of supply of electrical energy and the current in

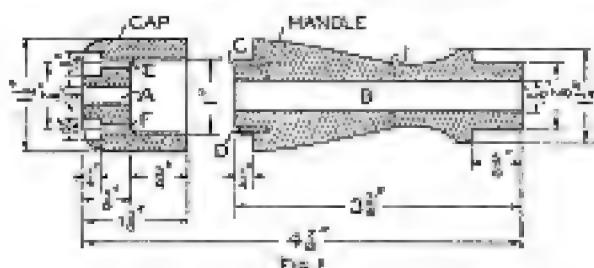


Fig. 2

Dimensions of the Wood Handle and Detail of the Ferrule and End That Enters the Cap

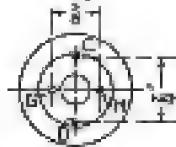


Fig. 3

the coil, the three being in the relation indicated by the following formula:

$$\begin{aligned} \text{Watts} &= \text{voltage} \times \text{current, or} \\ \text{Watts} &= \text{volts} \times \text{amperes.} \end{aligned}$$

Thus, if it is desired to have a coil that will operate on a 110-volt circuit and not take more than 90 watts, its resistance can be calculated by dividing the power in watts by the pressure. The quotient is the current:

$$\text{Current} = 90 \div 110 = .818+ \text{ ampere.}$$

Further, the resistance of the coil must be such that the product of the current, in amperes, and the resistance, in ohms, is equal to the voltage of the circuit to which the coil is to be connected, or the resistance is equal to the voltage divided by the current:

$$\text{Resistance} = 110 \div .818+ = 134+ \text{ ohms.}$$

The resistance of the wire used in winding the coil should be 134+ ohms, and the wire should be of such size that it will safely carry the required current of .818+ amperes.

An electric soldering iron that will give very satisfactory results may be constructed as follows: Provide a piece of well seasoned maple, about 10 in. in length and about 1 3/4 in. square. From this piece of maple turn

two pieces having the dimensions given in Fig. 1. The main wires leading into the soldering iron pass into the handle through the hole A, and the outside edge of this hole should be rounded, as shown, so as to prevent

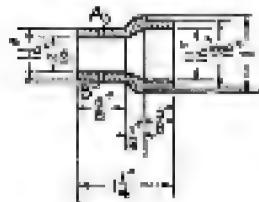


FIG. 4

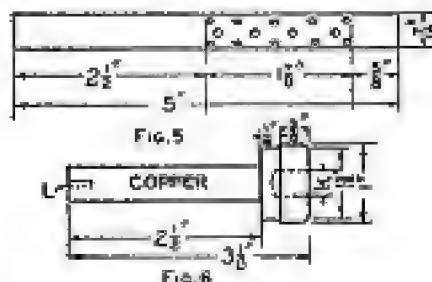


FIG. 6

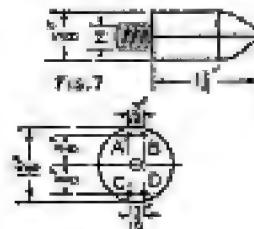


FIG. 8

Detail of the Tube and Parts Connecting the Wood Handle to the Copper Point, and the Copper Core for the Coil

the wires from being injured by any sharp corners. Before drilling the hole B, procure a piece of iron or steel tubing, 5 in. in length, having an outside diameter of approximately $\frac{1}{4}$ in. The wall of this tube should be about $\frac{1}{8}$ in. thick. Now drill the hole B in the handle so that the metal tube will have to be forced into place. Do not try to make the tube fit too tightly, as it is liable to split the handle when it is driven into place. Next make a brass ferrule, as shown in Fig. 2, and drive it on the small end of the handle part. If this ferrule is made from sheet brass, its ends should be soldered, or preferably brazed. You may be able to obtain a short piece of brass tubing of just the right inside diameter and thickness to make the ferrule. The two holes, C and D, are for screws that pass through the holes E and F, and serve to hold the handle and cap together. Two other small holes, G and H, Fig. 3, should be drilled in the end of the handle part, to be used in mounting two small binding posts that are to serve as terminals for the winding of the heating coil and provide an easy means of connecting the ends of the wires that lead into the end of the handle to the winding. The writer used two pieces of brass rod, about $1\frac{1}{2}$ in. long, with one end threaded, to take the nuts from the terminals of dry cells, and the other end sharpened and driven into the holes G and H until about $\frac{3}{8}$ in. of

the threaded end projected. Each of these was then provided with two small washers and two flat nuts. The hole J should not be drilled until the metal tube has been forced into the handle. The handle is now complete

and should be smoothed down and given several coats of shellac.

Next obtain a piece of wrought iron and from it turn a piece having the dimensions given in Fig. 4. The narrower opening in this piece should be of such size that it will fit very tightly over the end of the metal tube shown in Fig. 5. Force one end of the tube into the opening in the wrought-iron piece to a distance of $\frac{5}{8}$ in. Drill two small holes, A and B, Fig. 4, through both the wrought-iron piece and the tube and put a rivet in each of these holes. The outer end of the holes should be countersunk and the rivets can then be filed down level with the surface of the wrought-iron piece. The other end of the tube should be driven into the wooden handle to a distance of $3\frac{1}{2}$ in. Now drill the hole J, Fig. 1, and put a metal pin through it. The part of the pin inside the tube should be cut away so as not to obstruct the opening. Then drill a number of $\frac{1}{8}$ -in. holes in the metal tube, as shown in Fig. 5. These holes are for ventilating the iron, and will considerably decrease the amount of heat transmitted to the handle from the heating element.

Obtain a piece of copper of such size that from it can be cut a piece having the dimensions given in Fig. 6, with the core part $1\frac{1}{8}$ in. in diameter. This piece is to form the core of the heating coil. A hole, K, about $\frac{3}{8}$ in. in diameter, should be drilled in

the large end of this piece and threaded. Drill a small hole, L, in the other end and thread it to take a $\frac{1}{8}$ -in. machine screw.

Procure a piece of steel tubing $3\frac{3}{8}$ in. long and having an inside diameter of $\frac{1}{2}$ in. Slip one end of this tube over the piece shown in Fig. 4, and drill four small holes through it and the wrought-iron piece. Space these holes an equal distance apart around the tube and about $\frac{1}{8}$ in. from its ends. All the holes should be threaded and small machine screws provided. Slip the copper core into the other end of the steel tube and drill four holes in this end, and thread them just as was done at the other end. The tube should fit tightly on the wrought-iron and copper pieces, and the ends should be squarely against the shoulders when the holes are drilled. A soldering point can now be made as shown in Fig. 7. The threaded end M should be of such a size that it will fit snugly in the opening K in the piece shown in Fig. 6. The point can of course have any desired shape, depending upon the work for which the iron is to be used.

The point of the iron, and the core can be made in one piece, which under ordinary conditions will, perhaps, give the best results, as the point cannot come loose and the heat can be better transmitted to it from the heating element.

The iron is now complete with the exception of winding the coil and, if desired, finishing the metal parts so that they will present a little better appearance. Cut from some heavy sheet mica, about $\frac{3}{8}$ or $\frac{1}{2}$ in. thick, a washer having an outside diameter of $\frac{11}{16}$ in. Drill a hole in the center of this washer so that the small machine screw that is to fit into the hole L, Fig. 6, will just pass through it. Drill four other holes, A, B, C and D, in the washer, as shown in Fig. 8. Obtain a small metal washer about $\frac{3}{8}$ in. in diameter with an opening in it of the same diameter as the opening in the center of the mica washer. Now fasten the mica washer to the end of

the copper core with the machine screw, placing the small metal washer between the mica washer and the head of the screw. After the screw



FIG. 9

The Assembled Parts Which Make Up the Complete Electric Soldering Iron Ready for the Current

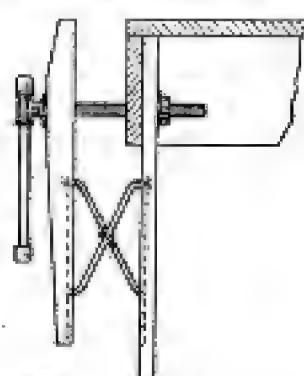
has been drawn up tightly drill a small hole through the metal and mica washers, near the edge, and about $\frac{3}{8}$ in. into the copper core. Drive a small brass or copper pin into this hole which will serve to prevent the mica washer from turning around. The object of preventing the mica washer from turning around, is to give a solid anchorage for the terminals of the coil and the leads that are to be carried back through the handle. The leads from the coils to the back end of the handle should be insulated with asbestos as any other kind of insulation will not withstand the heat. These leads should each be about 10 in. in length. Then obtain about $40\frac{1}{2}$ ft. of No. 28 gauge bare Superior resistance wire. This is a special kind of resistance wire which at that gauge has a resistance of 3.32 ohms per foot. Another kind of resistance wire known as "Ia la" has a resistance of 1.89 ohms per foot for No. 28. If this kind of wire be used, 71 ft. will be required. The coil is wound as follows: Pass the end of one of the asbestos-insulated leads back and forth through two of the small holes in the mica washer, that are near each other, a number of times, allowing about 1 in. of free wire to protrude through the washer toward the inner part of the spool. Attach one end of the resistance wire firmly to the end of the terminal wire. Then wrap around the copper core a thin sheet of mica and start winding the resistance wire on. The spacing between the adjacent turns should be approximately equal to twice the diameter of the wire. Do not run the winding nearer the end of the core than $\frac{1}{4}$ in. Place a thin sheet of mica between each layer of the winding and continue the winding until the required

length of wire has been used. The outside end can be terminated just as the inner end, and the winding is complete. Now place the coil inside the metal tube, shoving the leads back through the handle. Fasten the ends of these leads under the binding posts. Procure a piece of lamp cord and an attachment plug. Attach the plug to

one end of the cord and pass the other end through the opening A in the handle. Tie a knot in the cord inside the handle and fasten the ends under the binding posts. Two slender screws, at least 2 in. in length, should be provided to fasten the handle and cap together. The now completed iron will appear as shown in Fig. 9.

A Carpenter's Vise Adjuster

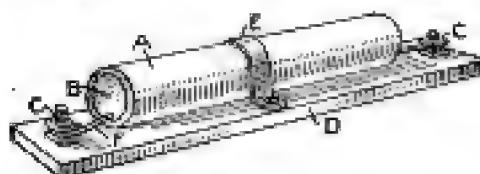
The accompanying sketch of a vise adjuster was redrawn from an illustration given by a correspondent of the American Carpenter and Builder, which he claims to be superior to the usual adjustment bar of a carpenter's vise.



The vise will always have parallel jaws in any position and there are no pins to set. The substitute bar is made of metal, similar to a pair of shears, the upper ends having eyes to fasten them permanently to the bench leg and vise jaw, while the lower ends slide in grooves as shown by the dotted lines.

A Homemade Fuseblock

In almost every steam plant there are a number of discarded water-gauge glasses and in one instance the engineer used them to make electric fuse holders. The glasses were cut



The Barrel of the Fuse Block Consists of a Water-Glass Gauge Filled with Plaster over the Wire

into short pieces, A, and fastened to a base, D, made of fiber, wood or hard rubber, with a clip of metal, E. The

fuse wire F was run through the glass and fastened at the ends with small bolts, CC. The space B is filled with plaster-of-Paris. When the fuse burns out, it takes but a few moments to unscrew the clip and put in another glass tube inclosing a perfect fuse. The burned-fuse receptacles may be saved and filled again.—Contributed by Jas. E. Noble, Toronto, Ont.

Wax Seals on Glass

In a wholesale house where I worked we had considerable trouble in making wax seals adhere to a glass bottle as shown in the sketch. The seals would break and come off in shipping. After considerable experimenting we found that by pasting a circular piece of paper, a little smaller than the seal, on the bottle and then covering it with the hot sealing wax, the seal would stay permanently.—Contributed by Fred Schumacher, Brooklyn, N. Y.



Stop for a Typewriter Ribbon

Owning a typewriter on which the reversal of the ribbon was not automatic, I was often troubled by the ribbon running off one spool or the other before I noticed it, necessitating a tedious job of rethreading the ribbon through the guides and running it onto the empty spool.

This trouble was overcome by simply putting a small clasp on the ribbon near the end so that it was im-

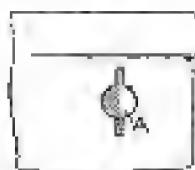
possible for the ribbon to run off the spool, as the clasp would stop further progress when it reached the guides. It is also quickly noticed as soon as it approaches the guides, thus reminding the user to reverse the ribbon.

Any small article may be used, such as a brass paper clip, or any other article that will not interfere with the winding of the ribbon on the spools, but will be easily seen. This simple device will soon prove its usefulness to any user of a typewriter of this kind.—Contributed by T. L. Parker, Wibaux, Mont.

Repairing Leak in a High-Pressure Tank

The inside of a tank, being used under city-water pressure, was inaccessible, due to the construction. A hole developed in one side, a little larger than $\frac{1}{8}$ in. and about 1 in. from the top. The hole could not be soldered, and it was finally repaired in the following manner:

It was first enlarged so that the head of a $\frac{1}{8}$ -in. stove bolt would easily slip through, and a longitudinal slot then cut across as shown at A, this slot being long enough to allow a washer to be slipped through. A piece of small wire was securely fastened to the screw end of a $\frac{1}{8}$ -in. stove bolt, B, to hold it while the head of the bolt was stuck into the tank, and a washer, C, passed over the wire and pushed inside the tank sideways through the slot. A piece of thick rubber gasket, D, with a hole a little smaller than the body of the bolt, was made into a

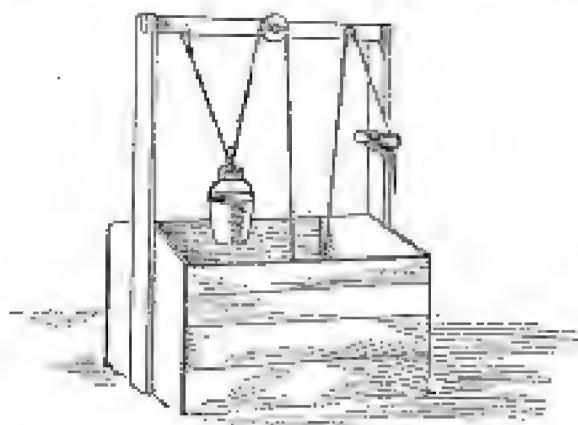


The Shape of the Hole Cut in the Tank to Admit the Screw Head and Washer

washer large enough to cover the slot. This washer was secured in place by a large iron washer, E, which was held with the nut.—Contributed by H. A. Sivas, Columbus, O.

Drawing Water from an Open Well

The illustration shows a good rig for drawing water from a well. While the full bucket is being raised the

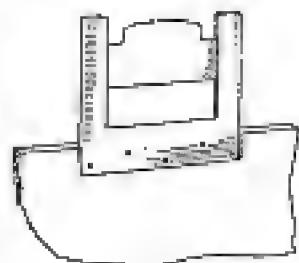


Equalizing the Rope and Counterbalancing the Buckets to Make It Easy to Draw Water

empty one goes down. In this manner nothing but the water is lifted, as each bucket counterbalances the other. A swivel should be put in the end of the rope to keep it from twisting. The cleat is used to take up or let out the rope as the water rises or lowers in the well.

Paintbrush Cleaner

A very handy device for use in a paint shop is a brush cleaner as shown in the sketch. It is made of two pieces of sheet iron which are attached to a vat or tub. The brush is placed between the uprights and the piece between them is pressed down on the brush as it is drawn through. It readily removes all surplus paint in a brush.



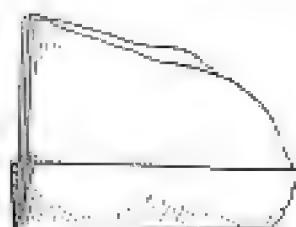
Softening Leather in Gloves and Boots

The leather in high-top boots and gauntlet gloves may be softened and made waterproof by the use of plain mutton tallow. Apply hot and rub in well with the fingers.

POPULAR MECHANICS

Inserting Manifold Papers in a Typewriter

When inserting more than one sheet of paper in a typewriter for manifold work it is difficult to keep the sheets together and in proper relation to each other. If a small strip of paper is folded V-shaped and placed over the ends of the paper sheets and then inserted in the machine, it will keep them in their proper places.



Soft Faces for Hammers

A soft-metal hammer is sometimes useful, but the kind of work for which it is required hardly warrants the expense of buying a copper hammer, says the Model Engineer, Lou-



The Soft Face is Easily Attached and Detached from the Hammer

don. The substitute shown in the sketch is a copper or soft-brass casting fitted on the face of the hammer and fastened with three screws. The pattern for the casting can be turned hollow, no core being necessary. If a lead cap is required, it should be cast thicker on the end.

Removing a Broken Pin

When overhauling the transmission of an automobile it was found that the thrust button in the end of the drive shaft was broken off flush with the end of the shaft. As the button is hardened, it was out of the question to drill it out without annealing. No fire was handy, and even if there had been, the heat would destroy

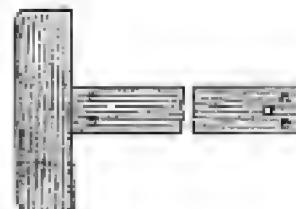


the finish on the bearing. It was decided to remove the button as follows: A hole was drilled into the shaft at the end of the button shank. The small space back of this was filled with gunpowder which was fired, successfully removing the broken button end.—Contributed by Frank C. Schmidt, Dayton, O.

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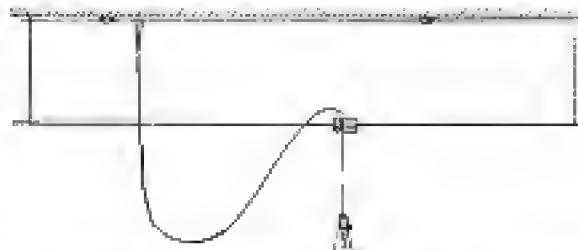
To Prevent a T-Square from Soiling Drawing

When working over a drawing for several days, the instruments soon soil the drawing and it becomes difficult to read the dimensions. The T-square is one of the instruments that causes the most of this kind of trouble. But if thumb tacks are inserted in the blade of the T-square, as shown in the sketch, the heads of the tacks will raise the blade slightly from the surface of the paper or tracing, and no soiling of the drawing will result.—Contributed by H. L. Prout, Cleveland, O.



A Movable Droplight

A very handy way to support an electric droplight, for the workbench or in front of shelving in a store, is to attach the cord to a porcelain insulator which is slipped on a wire stretched in the place desired. The insulator can



The Cord of the Droplight is Attached to a Sliding Porcelain Insulator

be slid along the wire to any point where the light is wanted.—Contributed by M. E. Duggan, Kenosha, Wis.

A Cost System for Small Shops

The card system shown in the illustrations is for a small machine shop, but with slight changes it could be used for factories as well. There is a great deal of waste caused by failure to carefully account for every item of labor and material, and frequently business failure is the result.

In a small shop, the cost of putting in and maintaining a complete card system is prohibitive, yet some method of accounting is necessary. The system here illustrated was made up for this purpose, and from years of ex-

This Card is Kept by the Employee as the Work Proceeds and is Turned over to the Foreman at the End of the Day

All Time and Material are Posted on the Cost Ticket Which Compiles All Items on One Job.

POPULAR MECHANICS

MONTHLY OVERHEAD REPORT		
POWER	FUEL	150
	WATER	5
	LIGHT	25
	OIL	350
RENT, ETC.	RENT	125
	INSURANCE	6
	DEPRECIATION	150
	TELEPHONE	3
MAINTENANCE	WASTE	4
	TOOL STEEL	10
	FILES	5
	BELTING	5
MATERIAL	SMALL TOOLS	15
MISCELLANEOUS		95
	Foreman	125
	Engineer	85
	Watchman	65
SALARIES	Helpers	45
		924.50
	Pay Roll	1356.63
	Overhead expense = 40% CHECKED MR	2311.12

Items That cannot be Charged to a Customer are Entered on This Card

perience in the jobbing business, has been found not to interfere in the least with the use of a time-recording clock

TOOLS DELIVERED TO EACH MAN ON ENTERING SERVICE AND MUST BE ACCOUNTED FOR ON LEAVING

NAME	DATE COM.	DATE LEFT
J. Smith	Jan. 1, 1911	
NO.	NAME OF TOOL	COST
1	12" Monkey Wrench	.65
1	Oil Can	.25
1	12" Flat Bastard File	.28
1	16" " Mill "	.35
1	8" " " "	.15
1	12" Square Bastard "	.25
1	12" Round File	.30
1	12" $\frac{1}{2}$ " " "	.30
1	Box 4- $\frac{1}{2}$ - $\frac{3}{4}$ " Plug Tops	.225
7	File Handles	.35
1	Flat Chisel	.16
3	Cape "	.16
2	Saw Blades	.12
1	Brush	.60
1	lb. Waste	.09

RECEIVED ABOVE

SIGNED J. Smith

All Tools are Charged to a Workman When He First Commences Work, and They must be Accounted for When He Leaves the Company's Employ

from which to make up the pay roll. In connection with these cards a record book should be kept, stating when a job was taken in and when it is to be delivered, together with all other details connected with it, for future reference.

The daily time card is kept by the employe as the work proceeds, and is turned in to the foreman at the end of the day. After being checked up by the foreman, the card is turned in to the office to be posted on the cost ticket. The card has a place for the workman's name and number, the date, job number, kind of work, etc. If the job is finished,

MATERIAL PERPETUAL INVOICE

KIND OF MATERIAL	#4 Babbitt	COST 5 $\frac{1}{2}$			
BAL	DATE	OUT JOB NO.	IN FROM	AMOUNT	REMARKS
OUT					
BAL	11-1-11			10.5 lb.	
IN	11-8-11		M. L. Mfg. Co.	100 lb.	
BAL	"			20.5 "	
OUT	11-10-11	2.5		12 "	
BAL	"			19.3 "	

IN
BAL
OUT
BAL
IN

Items of Stock Coming In or Going Out are Entered on Cards Which Thus Form a Perpetual Invoice

commenced or held over, a check mark is placed under the respective headings.

Time and material are posted from the daily time card to the cost ticket, after which the percentage of overhead and running expense is added. The sum of these figures shows the total cost of the job. If a piece of work is done for the shop, it is accounted for on the daily time card and sent through the regular routine just as if it were for a customer.

A monthly overhead report or factory-expense card collects all charges of labor, material, expense and permanent equipment of any kind that cannot be charged to customers' work.

Another card is kept for each workman, showing the tools given him on entering service, and he must account for the same kind and number on leaving the factory. The workman receipts for the tools on the card, and it is filed away. Tools worn out and discarded in service are replaced without charge to the workman, but if lost or destroyed by carelessness, the workman must pay the actual cost of the tool. When he leaves the employ, the card is checked up before he is finally paid off.

Material perpetual invoice or stock

WORKMAN'S ORDER

NAME	J. Smith	DATE	Nov. 10, 1911
JOB NO.	25	WHO FOR	John Jones
<u>INSTRUCTIONS</u>			
Go to mill and babbitt 2 bearings on corn shrelder.			
Use #4 Babbitt			
Rush			
FOREMAN J			

Instruction Card Giving Details on a Job; Made Out by the Foreman

cards are kept. These cards should be arranged in a box with a bottom sufficiently inclined to allow the kind of material written on the top to be exposed to view, for convenience in locating the desired card. This card serves as a double check on material going out and also as a perpetual stock invoice. The space at the top is for the kind of material with cost, and the columns show how much is taken out, as well as how much was received, where it was received from, and when.

An order card is issued to the workman to instruct him on a job. The foreman makes out this card, and the workman follows the instructions and uses it in making up his time card.

Reviving Old Printing-Press Rollers

Printers of the days when each office made its own rollers probably know of it, but of the present generation who buy their rollers ready-made only few may be aware that washing the rollers carefully and then covering them with thin molasses will materially soften and freshen them. I was once member of an office force who had difficulty in convincing the proprietor that too old

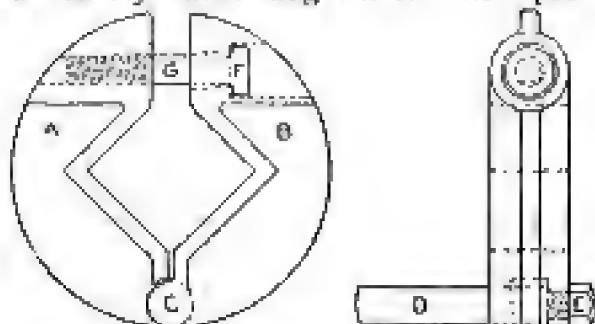
rollers caused the poor print on the paper. After the new rollers were finally ordered, we washed the old rollers and covered them with molasses, which was left on for a day or so. When put into commission again that week, the result was nearly equivalent to that obtained with new rollers, and they remained in good condition until the new rollers were received and suffi-

ciently seasoned to be placed on the press.

The job man who feels hurt because the "boss" won't provide him with new rollers to enable him to produce good work, can, with a couple of cents' worth of molasses and a few minutes' time at night, provide himself with pretty good rollers for the next morning. In the old days rollers were made principally of molasses and glue, and molasses or some equivalent doubtless forms one of the main ingredients in their construction today.—Contributed by C. W. Goddard, Muskegon, Mich.

A Lathe Dog that Clamps on the Work

The accompanying illustration shows a safety lathe dog with no protruding screw to catch the clothing or to mar the work being turned.



The Form of the Dog is Circular with no Projections to Catch in the Clothing

truding screw to catch the clothing or to mar the work being turned.

The pieces A and B are jointed at C and are held together with a stud, D. The locknut E keeps the stud tightly in place. The body of the

screw F is made square at G so it may be turned with a wrench. This screw is used to clamp the dog onto the work.—Contributed by F. G. Marbach, Cleveland, O.

Temporary Repairs on Gasket Blow-out on Engine Cylinder

A part of a gasket was blown out of the joint on the cylinder head of an engine driving a dynamo for electric lighting. The engine could not be stopped for repairs, so a temporary repair was made as follows: A piece of cloth was folded to form three layers and placed over the leak. A piece of large copper wire was wound around the cylinder and cloth several times just over the leak, and the ends were twisted up tightly with a pair of pliers. This stopped the leak so that the engine was run seven hours until it could be stopped for permanent repairs.—Contributed by Jonathan W. Reynolds, Philadelphia, Pa.

Eyelets for Belts

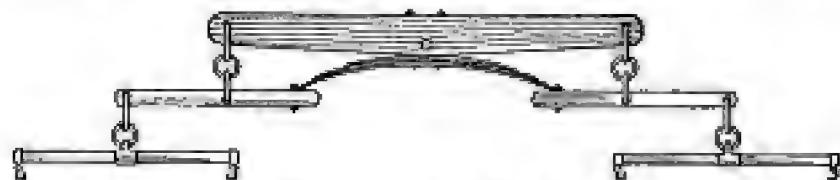
If eyelets, such as used in shoes, are put into the lace holes of a belt, the belt will last much longer. The eyelets, which may be taken from old shoes, will prevent the lace from tearing out. I have used this method on several kinds of belts, always with entire satisfaction.—Contributed by Irl R. Hicks.

A Shock-Absorbing Doubletree

When a team is pulling a heavy load over a rough road or pavement, it is

tigue. The sketch shows how to make a doubletree that will absorb all shocks and sudden jerks and prevent sore shoulders.

The spring may be one taken from an old buggy. All teamsters that care for their horses and want them to stand up to heavy work without constantly having sore shoulders,



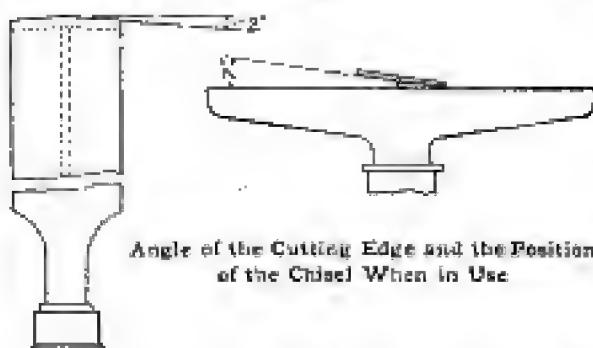
An Old Buggy Spring Is Fastened to the Center of the Doubletree So That the Ends will Engage the Arms to Which the Singletrees are Fastened

subject to repeated and sudden shocks which cause much unnecessary fa-

should make and use a doubletree like the one shown in the sketch.

Wood-Turning Chisel

The sloping edge of a wood-turning chisel must be held at a very slight angle so that the chips may be cut away without tearing from the work. It is quite tiresome to hold a chisel in this position when working on a large piece. I overcome this fatigue by soldering a wire of the proper size to the under side and in the center of the chisel blade. This will give the right angle to the chisel edge, no matter which way it is cutting. The angle of tilt should be 7 deg., and the slope of the cutting edge ground to a 2-deg. angle. The angle gives the chisel a



Angle of the Cutting Edge and the Position of the Chisel When in Use

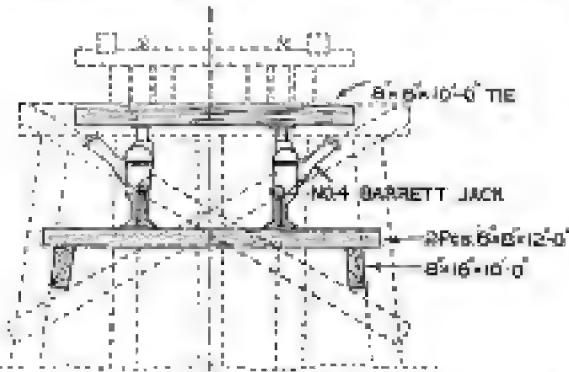
shearing action, and the corners will not dig into the grain of the wood.—Contributed by C. M. Graham, Waterloo, Ia.

Raising Trestles Quickly

In a case where several pile bridges had to be raised from 8 in. to 28 in. quickly in order not to interrupt the traffic, the following method was used by a correspondent of the *Railway Age Gazette*.

Second-hand 8 by 10-in. timbers were placed longitudinally on the pile, bracing the entire length of the bridge, as shown in the sketch. Ties, 8 by 8 in. by 12 ft. long, were placed on these stringers, and jacks set on them, while 8 by 8-in. by 10-ft. ties were laid on the head of the jacks, under the track stringers, of which there were three under each rail. The longest bridge raised was a 19-span structure, 243 ft.

long, with an average height of 16 ft. This entire bridge was raised with eight jacks, and a safe run off made in

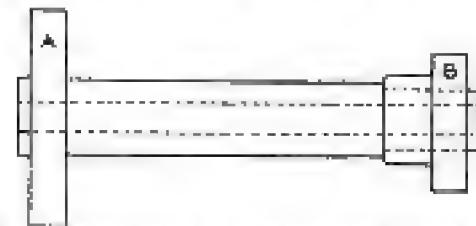


The Timbers on the Trestles to Support the Jacks for Raising the Tracks

10 hours. Dowels and lining bolts were put in place and all material picked up within this time. It required one day to place 8 by 16-in. timbers the entire length of the bridge.

Repairing a Broken Back Gear on a Lathe

The quill pinion B on the back gear of a foot-power lathe had several teeth broken out of it, and, owing to the lightness of the gear, it was not advisable to make repairs with pin teeth. The entire back gear quill with the two gears, A and B, was in one piece, and the owner thought he would have to buy a new one, until he hit upon the idea of shrinking on a piece of steel. This was done, the piece being first cut with the same number of teeth. The stem of the quill was turned down and the rim with the teeth shrunk on, and the part was as good as new. The



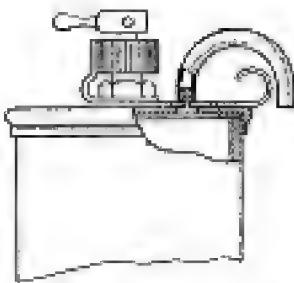
Form of the Back Gear of a Lathe Which was Repaired

dotted lines in the sketch indicate the bore of the quill and the end turned to receive the new gear.—Contributed by Donald A. Hampson, Middleton, N. Y.

POPULAR MECHANICS

Oil-Cup Vent Guard

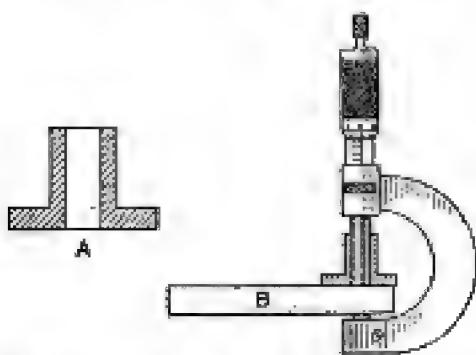
The ordinary glass sight-feed oil cup has a slide on top to permit filling, and the slide has a hole for a vent, says Power. To prevent dirt and grit working in through the vent hole, bend a piece of small copper tubing, having a $\frac{1}{16}$ -in. hole, into a U-shape and solder it to the slide, with the hole in the tube over the vent in the slide. This will give the necessary vent and the dirt and grit falling on the cup can be wiped off—not in.



it to the slide, with the hole in the tube over the vent in the slide. This will give the necessary vent and the dirt and grit falling on the cup can be wiped off—not in.

How to Lap a Micrometer

When the measuring surfaces of a micrometer become worn so that they do not measure accurately, the micrometer must be thoroughly washed in gasoline, then adjusted so that it will measure one-half thousandth of an inch over size, and a collar fitted to lap the end of the spindle true. The collar is turned up as shown at A, hardened, and the hole lapped so that it will be a snug fit on the upper spindle. Place the collar on a mandrel or plug and grind the bottom face. After this is done, put the collar on



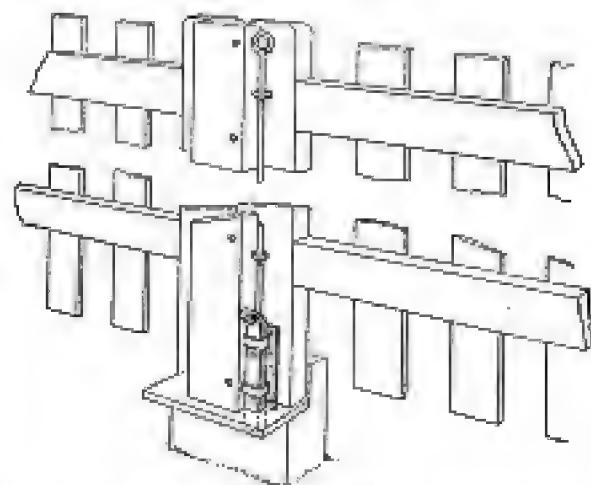
The Shape of the Collar and Manner of Using It in Lapping a Micrometer

the upper spindle and procure a flat piece of cast iron with the upper and lower sides absolutely parallel. Use the cast-iron block for lapping. Lap with flour of emery and oil until the

micrometer measures accurately. The little collar serves to hold the micrometer in the right position while lapping.—Contributed by Chas. Homewood, Waterloo, Ia.

Latch for Heavy Double Gates

The sketch illustrates a very substantial and easy method of keeping heavy swinging gates closed. The device consists of a heavy door bolt, for sale at almost any hardware store, which is fastened to the gate and connected to a lifting rod as shown. The lifting rod is of iron about $\frac{1}{4}$ in. in diameter, which is securely fastened to the bolt and extended up to the top



Latch, Bolt Plate, and Lifting Rod as They are Attached to the Gate

of the gate. This rod is held in place with screweyes. An iron plate, about $\frac{1}{8}$ or $\frac{1}{4}$ in. thick, having a hole in it a little larger than the bolt and so adjusted that the bolt will fit into it when the rod is pushed down, is firmly screwed to the middle post of the gate as shown.—Contributed by Otto Kling, Ada, O.

Repairing Old Anvils

Heat the anvil sufficiently to draw the temper and let it cool slowly as when annealing steel. Plane or mill the surface and polish it smooth. Heat the anvil and caseharden. An old anvil can be made as good as new in this manner.

Tile Sewer Construction

By GEO. M. PETERSEN

Part II

Shoring and Bracing

When excavating in unstable ground or where there are heavy surface loads, which are likely to cause the sides of the trench to cave in, the sides are braced at 5 and 10-ft. intervals, as shown in Fig. 8. The most common method of bracing by using jackscrews and pieces of pipe for spreaders is shown at A, while at B is shown a common makeshift for the jack—a piece of 2 by 4-in. material, driven in tightly. The usual position of the uprights is shown in C, while D illustrates a diagonal method which is very satisfactory if continuous bracing is necessary for any great distance, as in heavy clay.

On excavations in sandy or loam soil it is sometimes necessary to build a box around the trench. This is called "shoring" and consists of a number of 2 by 4-in. pieces, about 5 ft. long, which are made up into a framework to hold the retaining boards. The trench must be wide enough at the start so that these pieces may be placed and driven down as the excavation progresses. Figure 9 shows this construction clearly. The pieces SS are

Laying the Tile

Begin at the trunk or branch sewer. Break into the manhole and cement a piece of sewer tile into the opening, the bell of the pipe being laid uphill

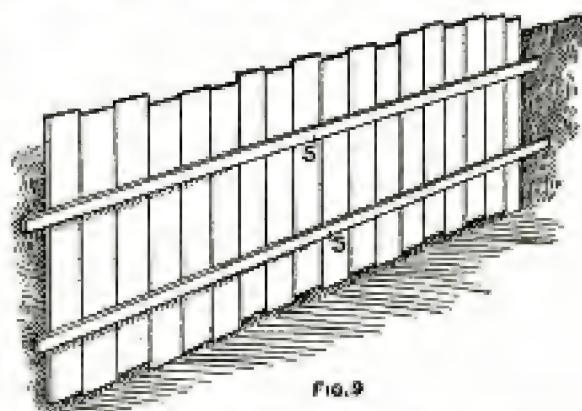
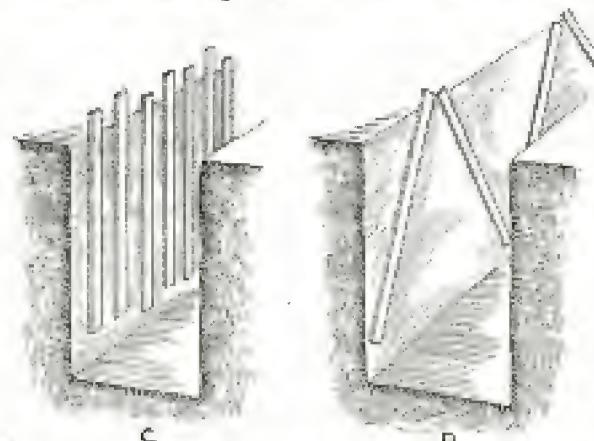
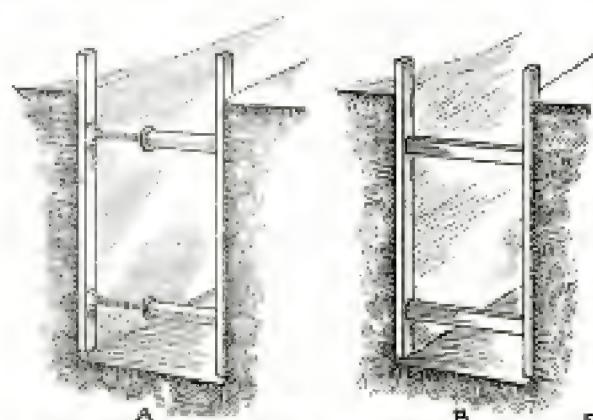


Fig. 9

The Shoring as it is Placed on One Side of a Trench in Sandy or Loam Soil

and to grade, as shown in Fig. 10. Oakum and cement are then placed on the invert, or bottom, of the bell and another tile placed in it. Oakum is then packed in all around the joint and mortared up with a cement mortar. The tile is lowered into the trench with the aid of a tile hook, illustrated in Fig. 11. The size of this hook naturally varies with the size of



Two Methods of Bracing, and the Usual Positions of the Uprights in Holding the Shoring Boards Against the Trench Sides to Prevent Caving

not nailed to the boards, but are held in place by jackscrews or wedged in as shown in Fig. 8, at A and B, so that the boards can be moved.

the tile with which it is used. The smaller sizes of tile, up to 24 in., can be lowered by hand, but if there are a great quantity of 24-in. tile, or larger,

it would be cheaper in many instances to construct a tripod, as shown in Fig. 12, and lower the tile with the aid of a tackle. On very large jobs, this tripod can be mounted on wheels and pushed along by hand on boards or light rails.

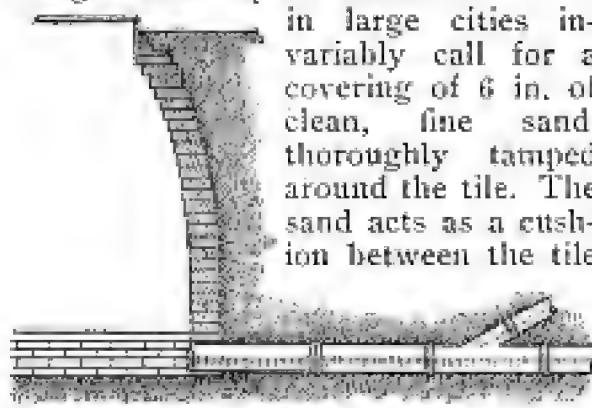


FIG. 10

The Tile is Laid with the Bell End Uphill, Commencing the Work at the Trunk or Branch Sewer

Specifications for sewers in large cities invariably call for a covering of 6 in. of clean, fine sand, thoroughly tamped around the tile. The sand acts as a cushion between the tile

and the hard earth to prevent the vibration of heavy traffic from reaching the tile.

When a manhole stake is reached, a break is left in the tile run for 5 ft. except at corners, where $4\frac{1}{2}$ ft. on the short side will be sufficient. When starting a new section, the first piece of tile is leveled at both ends with the aid of the sight rod, the crosspiece of which is sighted in between the rangers on either side. After the start is once made, the bell end of the tile is the only part that is leveled, as the opposite end must be right in the bell which was previously leveled.

When laying tile on branch sewers, house connections are placed for each lot. It is the duty of the inspector to locate these connections for the fore-



FIG. 11

Each Tile is Lowered into the Sewer with the Aid of a Tile Hook

man and also to keep a record of the exact location of each connection. The inspector must also check the rangers and oversee the work in general. The

house connections are ordinary pipe with, usually, a 6-in. branch, as shown in Fig. 13. They are laid with the branch facing up grade and on the side of the trench from where it is to be connected. Connections should be so laid out that when the house connection is laid, it will meet the sewer connection with a long swing, as a sharp turn is liable to become clogged. When the size of the tile is changed, and this is done very often in branch sewers, the change is made at the manhole.

Manholes

Manholes are also used in turning corners and are located from 150 to 200 ft. apart on the straightway run. The manholes are necessary at these points as they afford the only way of cleaning out the sewer if it should become clogged with dirt and refuse. The sewer manholes are constructed

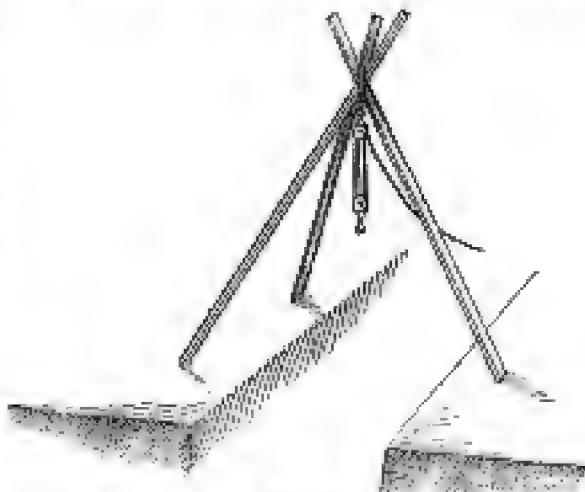


FIG. 12

Large Tile, 24-In. or More, may be Lowered with a Tripod Set over the Trench

of brick, as shown in Fig. 14, but, of course, the dimensions will vary slightly to meet different conditions. The invert is constructed to fit the tile which comes into it. If the incoming tile is 12 in. and the outgoing 15 in., the manhole invert will be shaped to accommodate both tiles. This invert should be constructed of two courses of brick, but it is seldom that more than one course is used. The branch walls are of stone, and usually old curbstone is used for making them. On a sewer with cuts varying from 7

to 10 ft., the manholes will require from 800 to 1,100 bricks each, and a first-class manhole builder with three or four laborers should easily build two or three a day.

Back Filling

The proper back filling of the trench is by far more difficult than the excavation. This is on account of the depth of trench, which is seldom less than 7 or 8 ft. When running water is at hand the work is greatly simplified, as the trench can be "puddled." The operation consists of back filling about 2 ft. of earth and then flooding the trench until there is about 6 in. of water on top. Throw in more dirt, pour in more water, and so on until the trench is filled completely. The earth should then be piled up on top of the trench before leaving the work.

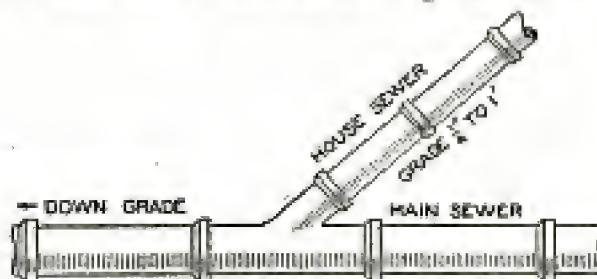


FIG. 13
Tile for a House Connection as It Is Laid to Enter a Main Sewer

If this work is properly done the earth should be piled 1 in. in height for each

To Remedy Flickering Lights on a Gas-Engine-Driven Dynamo

A 500-watt, 110-volt dynamo, driven by a hit-and-miss gasoline engine, gave trouble by the lights flickering. A balance wheel attached to the dynamo did not reduce the flickering. The dynamo was driven by an endless belt, with the grain or rough side to the pulley face. The trouble was remedied by turning the belt over so that the smooth side ran on the pulley. This arrangement allowed the belt to slip a little at each impulse of the engine, which caused the dynamo to run without a hitch and consequently the lights to burn evenly.—Contributed by R. A. Frear, Ithaca, N. Y.

1 ft. in width. This will fill up any settling that may take place.

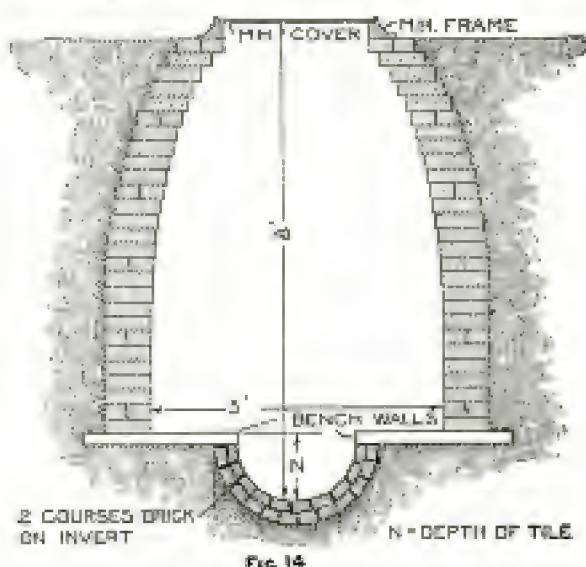


FIG. 14
Detail of a Manhole; Dimensions Very Slightly to Meet Different Conditions

If no water is at hand, the earth must be tamped in with a tamper. The tampers should be the kind used as paving pounders. Earth is thrown into the trench from 1 to 2 ft. deep and then it is well tamped with the heavy pounders. When a trench is back filled in this manner, all the remaining dirt from the excavation should be piled on top, no matter how well tamped, as it will sink and settle a great deal more than if it had been "puddled."

To Mark the Through-Way of a Cotter

While lying on my back under an automobile I found it very difficult to locate the cotter holes. This was

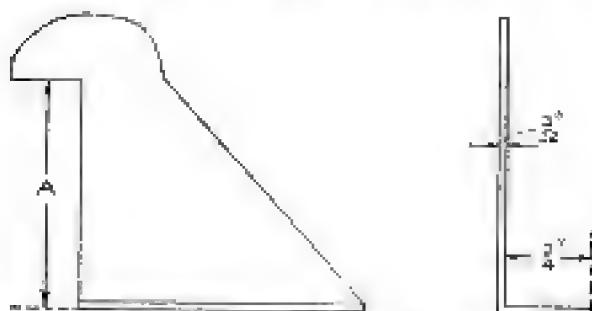


The Chisel Cut on the End of the Bolt Shows the Direction of the Hole

easily overcome by cutting a small mark with a chisel edge across the bolt end in the same direction as the hole in the bolt. A hole thus marked can be easily located.—Contributed by Chester L. Cobb, Portland, Me.

A Lathe-Tool Gauge

The gauge is made of $\frac{1}{8}$ -in. sheet metal in the shape shown in the sketch. It is used to set lathe tools

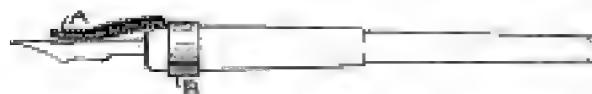


The Gauge is Used on Top of the Tool-Post Slide, to Set the Lathe Tool

centrally. Make the distance A equal to the distance from the lathe center to the top of the tool-post slide.—Contributed by Chas. Hattenberger, Buffalo, N. Y.

Reservoir Pen for Drawing Ink

The reservoir pen shown in the sketch has the advantage of being equally useful for writing or India-ink work, says a correspondent of American

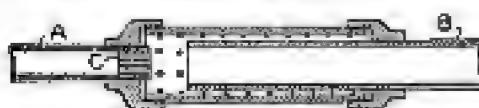


The Flow of Ink can be Regulated by Sliding the Wire on the Pen

Machinist. It is made of a coil of fine music wire, silver plated for writing ink, and attached to the penholder with a spring clamp. A silvered banjo string will do very well. The flow of ink to the point can be regulated by sliding the coil up or down on the pen point.

A Water Ejector

The device shown in the accompanying sketch is an effective means for emptying flooded cellars, trenches, etc.



Cross Section of the Ejector Which is Made Entirely of Pipe and Fittings

City-water pressure is the force used. As may be seen, it is made of a few pipe fittings, the body being of $1\frac{1}{4}$ -in.

pipe with a $1\frac{1}{4}$ to $\frac{3}{4}$ -in. reducer at one end and $1\frac{1}{4}$ to $\frac{1}{2}$ -in. reducer at the other. The pipe is perforated by a number of $\frac{1}{8}$ -in. holes. The pipe A, for connection to the water pressure, is $\frac{1}{2}$ in. and fitted with a $\frac{3}{8}$ -in. plug, C, having a $\frac{1}{8}$ -in. hole drilled through its center. The delivery pipe B has a long thread for adjustment to obtain the proper gap between the jet and delivery. When using the ejector it must be entirely submerged in the water it is to remove.—Contributed by J. J. O'Brien, Buffalo, N. Y.

Lead-Pencil Holder

A draftsman or illustrator constantly realizes the need of some device enabling him to use all of the drawing pencil. No drawing pencil less than 4 in. in length should be used and, considering their cost, it is rather expensive to waste the 6 or 7 cents' worth of the pencil which is practically useless without a holder of some kind.

The only thing I could find on the market for holding a stub of a pencil was a combination wood and metal device, rather cumbersome for drawing, and intended only for short pieces of pencil. The holder shown in the accompanying illustration takes a whole pencil and this can be used up to the last bit, when a new one may be inserted.

The holder is made of a hollow tube having the ends split to receive the pencil and eraser, which are firmly clamped in the holder by the pressure



A Hollow Tube Receives the Whole Pencil, Which can be Used Up to the Last Bit

from movable tightening bands.—Contributed by T. H. Lynn, Washington, D. C.

After cleaning furniture, the greasy appearance may be removed by adding some good, sharp vinegar to the furniture polish. Vinegar, which is nothing else than diluted acetic acid, is one of the best cleansers of dirty furniture.

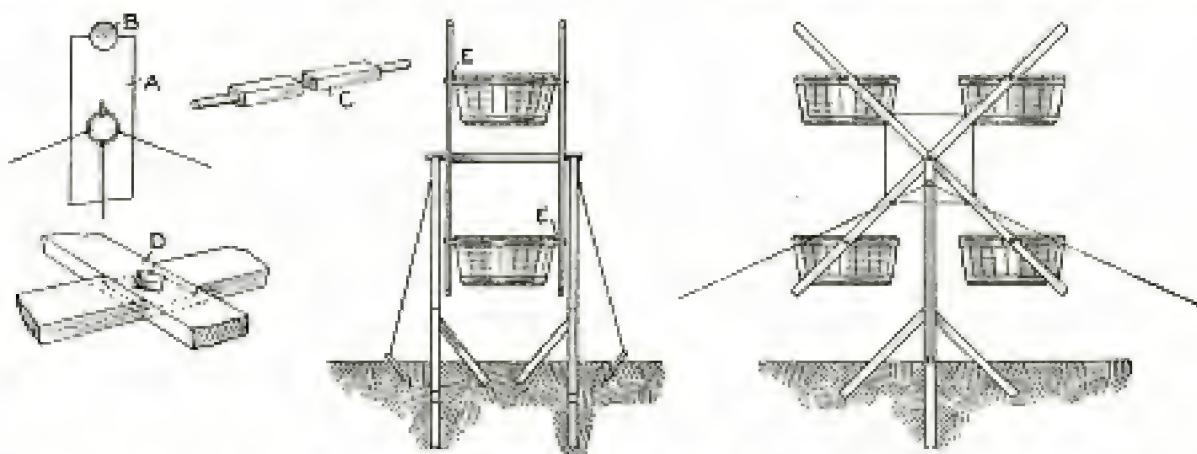


A Playground Ferris Wheel

The whole wheel is carried on two uprights, each 3 by 4 in., by 10 ft. long. In the upper ends of these pieces, A, a half circle is cut out to receive the main shaft B. The end of the uprights are sunk 3 ft. into the earth and about 4 ft. apart, then braced as shown. They are further braced by wires attached to rings which are secured with staples near the top. The bearings should each have a cap to keep the

each pair of pieces is crossed they will fit together with the surfaces smooth, as shown at D. A square hole is cut through the pieces as shown to fit on the square part of the main axle. While it is not shown in the illustration, it is best to strengthen this joint with another piece of wood, cut to fit on the axle and securely attached to the spokes.

The cars or carriers are made of two



Detail of the Uprights, Axe and Spokes, and the End and Side Elevations of the Completed Wheel, Showing Braces and Cars Attached.

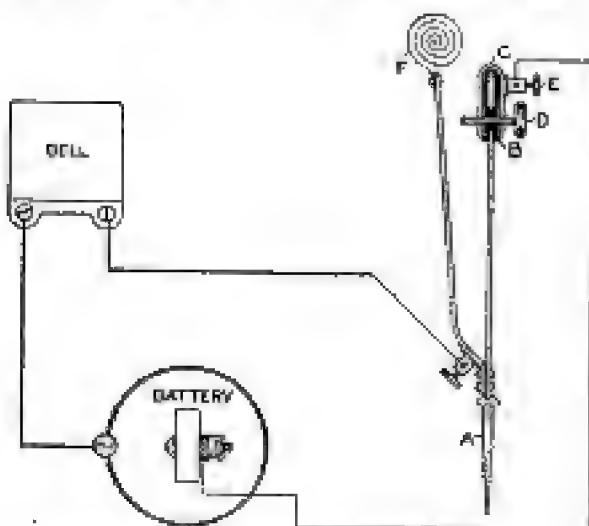
shaft in place. These can be made of blocks of wood with a semicircle cut out, the blocks being nailed over the shaft, while it is in place, the nails entering the ends of the uprights.

The main shaft C is made of a $2\frac{1}{2}$ -in. square piece of good material, 4 ft. long. The ends are made round to serve as bearings, and the square part is fitted with the spokes or car carriers. These consist of 4 pieces, each 1 in. thick, 4 in. wide and 13 ft. long. In the center of each piece cut a notch one-half the thickness so that when

sugar barrels cut in half. The hoops are then securely nailed, both inside and outside; a block of wood, E, securely attached to the half barrel on the outside, and another block on the inside opposite the outside block. Holes are bored $2\frac{1}{2}$ ft. from the ends of the spokes and a bolt run through them and through the blocks on the edges of the half barrels. The extending ends of the spokes are used to propel the wheel. Four children can ride in the wheel at one time.—Contributed by Maurice Baudier, New Orleans, La.

How to Make an Electric Fishing Signal

A unique electric fishing signal, which may be rigged up on a wharf or pier, and the electric circuit so ar-



Construction of the Parts to Make the Contact Points and the Electric Connections

ranged as to operate an electric bell or buzzer, located in the fisherman's cottage, or any other convenient place, may be constructed as follows: Obtain two pieces of $\frac{1}{8}$ -in. spring brass, one 6 in. long and $\frac{3}{4}$ in. wide, and the other 7 in. long and $\frac{1}{2}$ in. wide. Mount a 2-in. brass wood screw, A, in one end of the 6-in. piece as shown.

Place over the end of the 6-in. piece a thin sheet of insulating fiber, B, allowing it to extend down on each side about 1 in. Then bend a piece of $\frac{1}{8}$ -in. brass, C, over the insulating fiber, allowing it to extend down on each side the same distance as the insulating fiber. Drill a small hole through the lower ends of the U-shaped piece of brass, C, the insulation, B, and the 6-in. piece, while they are all in place. Remove the insulation and the U-shaped brass piece, and tap the holes in the brass for a machine screw, D. Enlarge the hole in the 6-in. piece, and provide an insulating bushing for it with an opening of the same diameter as the brass machine screw. Mount a small binding post, E, on one side of the U-shaped piece of brass, and the parts may then be put together and

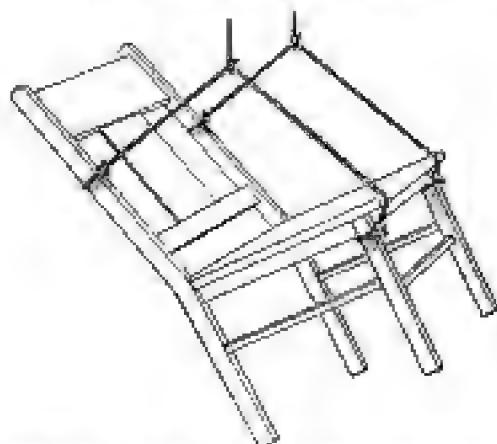
held in place by means of the brass screw.

Drill two holes in the other end of the 6-in. piece, also two holes in one end of the 7-in. piece, and rivet them together with two small rivets. The 7-in. piece should project beyond the end of the 6-in. piece. A piece of thin spring brass should be made into the form of a spiral, F, and fastened to the upper end of the 7-in. piece. Provision should be made for attaching the fishline to the inside end of the brass spiral. A small binding post should be soldered to either the 6-in. or 7-in. piece, at the bottom.

If the device is set up with the head of the brass adjusting screw in the top of the 6-in. piece, pointing in the direction the line to the fishing hook is to run, and if a fish pulls upon the line, the 7-in. piece is pulled over and touches the point of the adjusting screw. If a battery and bell, or buzzer, is connected as shown, the circuit will be completed when the 7-in. piece comes in contact with the adjusting screw, and the bell will ring.

A Chair Swing

A comfortable porch or lawn swing can be easily and quickly made with a chair as a seat, as follows. Procure some rope of sufficient strength to bear



The Ropes are Tied to the Chair so That It will be Held in a Reclining Position

the weight of the person, and fasten one end securely to one of the front legs of the chair and the other end to the same side of the back as shown

in the illustration, allowing enough slack to form a right angle. Another piece of rope, of the same length, is then attached to the other side of the chair. The supporting ropes are tied to these ropes and to the joist or holding piece overhead.—Contributed by Wm. A. Robinson, Waynesboro, Pa.

Another Broom Holder

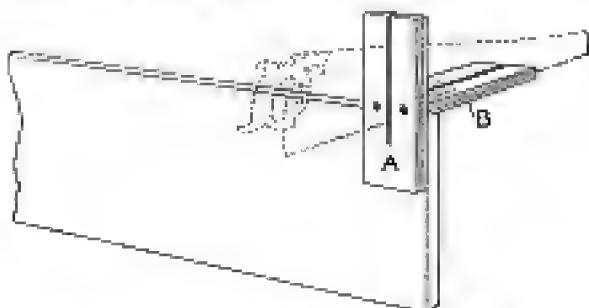
Of the many homemade devices for holding a broom this is one of the simplest, and one that any handy boy can make.

It consists of a string, about 1 ft. long, with a knot at one end and the other tied to a nail or staple driven into the wall. To hang up the broom simply turn the string around the handle as shown, and the broom will be held securely, because its weight will pull the string taut and the knot at the end will prevent the string from running off the handle.—Contributed by Jef De Vries, Antwerp, Belgium.



Squaring Wood Stock

The device shown in the sketch is a great help to the maker of mission furniture as a guide on short cuts. It



The Saw Teeth Edge can be Run through Both Pieces, the Stock being in the Corner

consists of two pieces of wood, A and B, preferably of oak, fastened together at right angles by two large flat-head screws. The pieces should be placed exactly at right angles.

A cut is then made through both pieces. The cut on B should be exactly at right angles to the surface of piece A. This device can be either clamped on a board or merely held by hand, and will insure a true cut.—Contributed by F. W. Pumphrey, Owensboro, Ky.

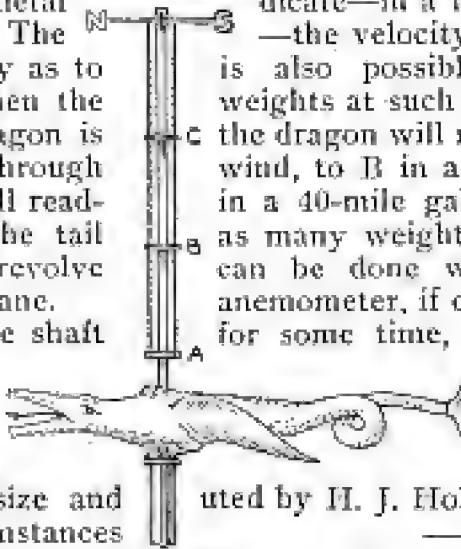
A Wind Vane

A novelty in wind vanes is shown in the accompanying sketch. The vane can be made of sheet metal or carved from light wood. The wings are so set on the body as to cause the dragon to rise when the wind strikes them. The dragon is pivoted on a shaft running through its center of gravity, so it will readily turn with the wind. The tail part may also be made to revolve as the propeller of an aeroplane.

The length and size of the shaft will depend on the dimensions of the dragon, and similarly, the location of the weights on the chains will be determined by its size and weight. Upon these circumstances and the varying velocities of the wind will depend how high the dragon

will rise on its shaft, and the height reached by it will thus serve to indicate—in a relative manner only

—the velocity of the wind, but it is also possible to arrange the weights at such distances apart that the dragon will rise to A in a 20-mile wind, to B in a 30-mile wind, to C in a 40-mile gale, and so on, with as many weights as desired. This can be done with the aid of an anemometer, if one can be borrowed for some time, or the device may be taken to the nearest weather bureau to be set.—Contributed by H. J. Holden, Ontario, Cal.



Never rock a file—push it straight on filing work.

Homemade Letters for Marking Bags

An initial marker for bags can be made of a beet or potato. Cut off enough of the vegetable to provide a flat surface of sufficient size and then cut out the letter as shown in the sketch, and use shoe blacking as ink. In cutting, remember that most of the letters must be made reversed in order to print right. For example, in making a B, draw it out on paper and cut it out, then lay the face of the pattern on the flat surface of the vegetable and cut around it.



must be made reversed in order to print right. For example, in making a B, draw it out on paper and cut it out, then lay the face of the pattern on the flat surface of the vegetable and cut around it.

To Keep a Crease in a Soft Hat

The crease in a soft hat can be kept in proper shape with the aid of a paper clip. The clip is slipped over



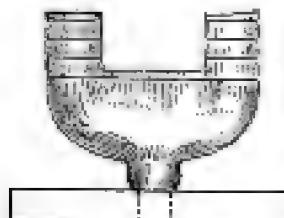
Paper Clip on the Fold, Holding It in the Right Shape for the Outside Crease

the fold inside of the hat which forms the bottom part of the crease.—Contributed by Jas. M. Kane, Doylestown, Pennsylvania.

A Shoe Scraper

A good boot and shoe scraper for a step can be made of a worn-out and discarded broom,

discarded broom. Cut off the straws and strings as shown in the sketch, allowing one string to hold them together, and make the notch the width of the



shoe. Tie the extending ends together, and mount the whole on a suitable block, or, if desired, a hole can be bored in the step to receive the handle, and the scraper thus securely attached.

This makes an effective scraper for the bottom as well as the sides of shoes of almost any size.—Contributed by Jno. V. Loessler, Evansville, Ind.

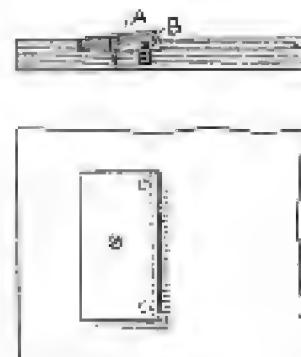
A Vegetable Slicer

A tin bucket or can makes a good slicer for vegetables when no other slicer is at hand. A number of slots are cut across one side of the can, and the lower edge of each slot slightly turned out to form a cutting edge. The vegetable is placed against the top of the can and pushed down over the slots. Each slot will cut off a slice which falls inside of the can.



Bench Stop for Planing Thin Boards

A bench stop for planing thin boards with a hand plane may be made in the following manner: Procure a piece of strap iron about $\frac{1}{4}$ in. thick, $1\frac{1}{2}$ or 2 in. wide, and about 6 in. long. File or grind one edge sharp on top and drill a $\frac{1}{4}$ -in. hole through the center. Cut a slot in a board or in the work-bench large enough to receive the stop A flat. Place enough strips of rubber or fit two coil springs, B, to raise the sharp edge out of the slot. Insert a screw in the hole of the stop and adjust it to the desired height by turning the screw up or down.



In a case of emergency, lemon juice may be used as soldering flux.

A Camp Provision Box

While on a camping and canoeing trip recently, I used a device which added a touch of completeness to our outfit and made camp life really enjoyable. This useful device is none other than a provision or "grub" box.

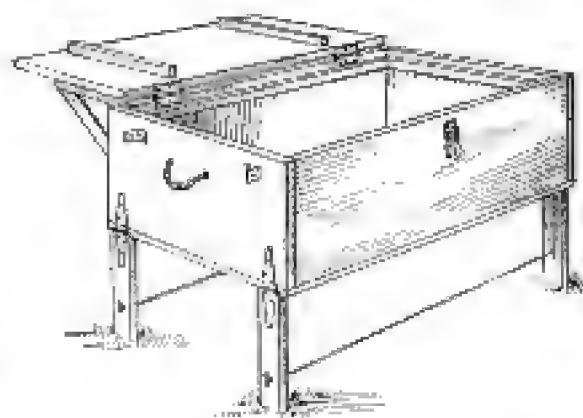
From experience campers know that the first important factor in having a successful trip is compactness of outfit. When undertaking an outing of this kind it is most desirable to have as few bundles to carry as possible, especially if one is going to be on the move part of the time. This device eliminates an unnecessary amount of bundles, thus making the trip easier for the campers, and doubly so if they intend canoeing part of the time; and, apart from its usefulness as a provision container, it affords a general repository for the small articles which mean so much to the camper's welfare.

The box proper may be made of any convenient size, so long as it is not too cumbersome for two people to handle. The dimensions given are for a box I

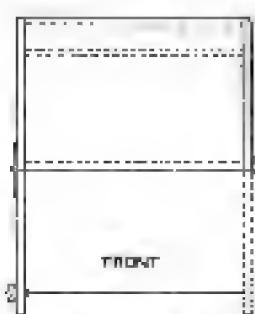
larger box is much to be preferred. A glance at the figures will show the general proportions of the box. It may be possible, in some cases, to secure a strong packing box near the required dimensions, thus doing away with the trouble of constructing it. The distinguishing features of this box are the hinged cover, the folding legs, and the folding brackets. The brackets, upon which the top rests when open, fold in against the back of the box when not in use. The same may be said of the legs. They fold up alongside the box and are held there by spring-brass clips.

On our trips we carry an alcohol stove on which we do all of our cooking. The inner side of the top is covered with a

sheet of asbestos, this side being uppermost when the hinged top is opened and resting on the folding brackets. The stove rested on this asbestos, thus making everything safe. The cover is large enough to do all the cooking on, and the box is so high that the cooking can be attended to without stooping

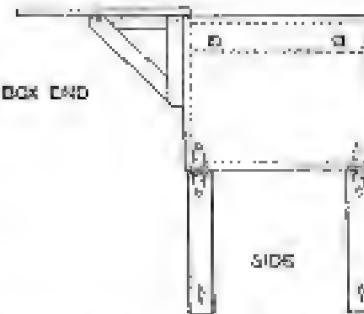


The Provision Box Ready for Use in Camp,
the Cover Turned Back on the Brackets
and the Legs Extended

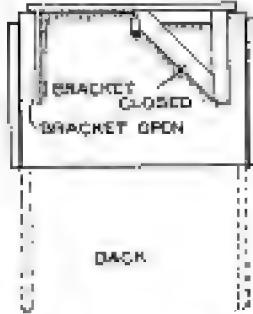


LEG AGAINST BOX END

FRONT



SIDE



BACK

The Brackets for the Cover as Well as Each of the Four Legs Fold Against the Sides of the Box in Such a Manner as to be Out of the Way, Making the Box Easy to Carry and Store Away in a Small Space

used on a canoe trip of several hundred miles; and from experience I know it to be of a suitable size for canoeists. If the camper is going to have a fixed camp and have his luggage hauled, a

over, which is much more pleasant than squatting before a camp fire getting the eyes full of smoke. The legs are hinged to the box in such a manner that all of the weight of the box

rests on the legs rather than on the hinges, and are kept from spreading apart by wire turnbuckles. These, being just bolts and wire, may be tucked inside the box when on the move. The



Detail of the Turnbuckle, Button to Hold the Brackets, and the Spring Clip for Holding the Legs on the Side of the Box

top is fitted with unexposed hinges and with a lock to make it a safe place for storing valuables.

In constructing the cover it is well to make it so that it covers the joints of the sides, thus making the box waterproof from the top, if rain should fall on it. A partition can be made in one end to hold odds and ends. A tray could be installed, like the tray in a trunk, to hold knives, forks, spoons, etc., while the perishable supplies are kept underneath the tray. Give the box two coats of lead paint, and shellac the inside.

The wire braces for the legs are made as follows. Procure four machine bolts, about $\frac{1}{4}$ in. in diameter and 2 in. long—any thread will do—with wing nuts and washers to fit. Saw or file off the heads and drill a small hole in one end of each bolt, large enough to receive a No. 16 galvanized iron wire. Two inches from the bottom of each leg drill a hole to take the bolt loosely. Determine the exact distance between the outside edges of the legs when the box is resting on them. Make the wire braces 1 in. longer than this distance so that the bolts will protrude through the holes in the legs and allow for putting on the nuts and washers. Screwing up on the nuts draws the wire taut, thus holding the legs firm.

The size of the top determines the dimensions of the folding brackets which support it when open. These brackets may be solid blocks of wood, but a lighter and more serviceable bracket is constructed as follows. If the top is 20 in. wide and 30 in. long,

make the brackets 10 by 13 in. Constructing the brackets so that their combined length is 4 in. shorter than the total length of the box, facilitates their folding against the back of the box when not in use. This point is clearly shown in the drawing. Our brackets were made of $\frac{1}{2}$ -in. oak, $1\frac{1}{2}$ in. wide, and the joints halved together. They are hinged to the back of the box as shown; and when folded are held in place by a simple catch. The weight of the lid is sufficient to hold the brackets in place when open, but to make sure they will not creep when in use, insert a $\frac{1}{4}$ -in. dowel in the end of each so that it protrudes $\frac{1}{4}$ in. Drill two holes in the top to the depth of $\frac{1}{4}$ in., so that when the top rests on the brackets, these holes engage with the dowels. In hinging the brackets to the back see that they are high enough to support the lid at right angles to the box.

The box here shown is made of $\frac{7}{8}$ in. white pine throughout. The legs are $\frac{7}{8}$ by $2\frac{1}{2}$ by 18 in. They are fastened to the box with ordinary strap hinges. When folded up against the box they do not come quite to the top so that the box should be at least 19 in. high for 18-in. legs. About 2 in. from the bottom of the legs drive in a brad so it protrudes $\frac{1}{8}$ in. as shown. This brad engages in a hole in the spring-brass clip when folded up as shown in the illustration.

If in a fixed camp, it is a good idea to stand the legs in tomato cans partly full of water. This prevents ants from crawling up the legs into the box, but it necessitates placing the wire braces higher on the legs.

Our box cost us nothing but the hardware, as we knocked some old packing boxes to pieces and planed up enough boards to make the sides. Of course, the builder need not adhere to these dimensions, for he can make the size to suit his requirements.—Contributed by C. A. Kotterman.

A blue writing ink is easily made of 1 oz. Prussian blue, $1\frac{1}{2}$ oz. oxalic acid and 1 pt. of soft water. Shake and allow it to stand until dissolved.

How to Make a Copper Stencil for Marking Laundry

A stencil suitable for marking laundry may be easily made as follows:

First procure a small sheet of "stencil sheet copper," about 1 in. wide and 4 in. long. Dip this sheet of copper in a vessel containing some melted beeswax, so that both sides will be evenly covered with a thin coat of the wax when it cools. The design—name, monogram or figure—that is wanted in the stencil should now be drawn upon a piece of thin white paper, the reverse side of the paper blackened with graphite, and then laid on the stencil plate with the design in the center of the plate, whereupon the design is lightly traced with a blunt point on the thin wax coating. After the paper is removed, trace the design on the wax surface with a pointed instrument, but not completely, the lines being broken at more or less regular intervals, to form "holders" so that, after etching, the design cannot fall out.

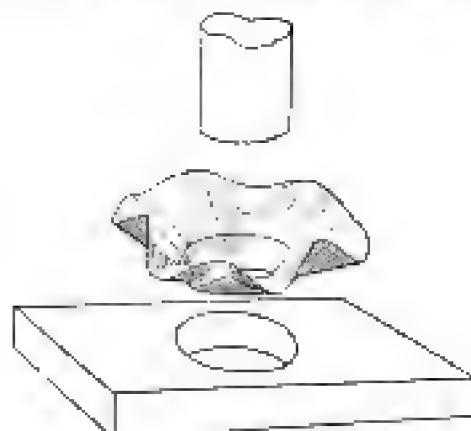
Next lay the stencil in a small shallow dish and pour a small quantity of fresh nitric acid over it. Keep the air bubbles removed from the surface by means of a piece of soft feather. The design will be eaten away in a very short time, where the wax has been removed, and this may be readily observed by holding the stencil plate up to the light. The acid should then be rinsed off with water, and the wax removed by heating and wiping it off with a cloth. The stencil may be given a final cleaning in a dish of benzine or gasoline, which will remove any remaining wax.

A Brass Pin Tray

A novelty pin tray can be easily made of a piece of No. 24 gauge sheet brass or copper, 5 in. in diameter. The metal is annealed and polished with fine emery cloth, which is given a circular motion to produce a frosted effect. The necessary tools are a 1-in. hardwood board with a $2\frac{1}{2}$ -in. hole

bored in it, and a round piece of hard wood, $1\frac{1}{8}$ or $\frac{3}{4}$ in. in diameter, with the ends sawn off square.

Place the sheet metal centrally over

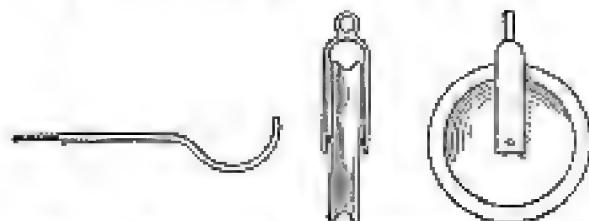


The Ferrule and Method of Using It to Produce a Wrinkled Edge on the Tray

the hole in the board and set one end of the round stick in the center of the metal. Drive the stick with a hammer until a recess about 1 in. deep is made in the center. The edge of the metal will wrinkle up as shown in the sketch. It is scarcely possible to make two trays alike, as the edge almost invariably will buckle in a different manner.—Contributed by E. Van Eps, Plainfield, N. J.

A Homemade Exerciser

A weight machine for exercising the muscles of the arms is easily constructed by using two screw hooks, 5 in. long, and two small pulleys, $2\frac{1}{2}$ in. in diameter. An awning pulley can be used for this purpose. The hole at the top of the hanger will allow the pulley to freely turn at almost any

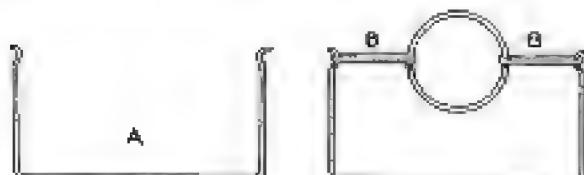


The Yoke of the Pulley is so Arranged as to Make It Move in All Positions on the Hook

angle. A paving brick or a piece of metal can be used as a weight for each rope.—Contributed by Sterling R. Speirs, St. Louis, Mo.

How to Make a Flutter Ring

The flutter ring is for inclosing in an envelope and to surprise the person opening it by the revolving of the



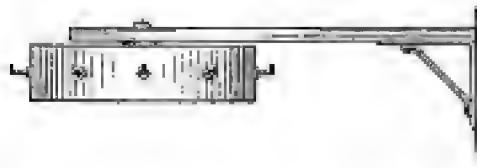
The Shape of the Wire and Manner of Attaching the Rubber Bands to the Ring

ring. The main part is made of a piece of wire, A, bent so that the depth will be about 2 in. and the length 4 in. Procure or make a ring, 2 in. in diameter. The ring should be open like a key ring. Use two rubber bands, B, in connecting the ring to the wire.

To use it, turn the ring over repeatedly, until the rubber bands are twisted tightly, then lay it flat in a paper folded like a letter. Hand it to someone in this shape or after first putting it into an envelope. When the paper is opened up, the ring will do the rest.—Contributed by D. Andrew McComb, Toledo, O.

A Kitchen Utensil Hanger

Every cook knows how troublesome it is to have several things hanging on one nail. When one of the articles is wanted it is usually at the back, and the others must be removed to secure it. A revolving rack for hanging a can opener, egg beater and cooking spoons, etc., takes up less



The Hook Support Revolves so as to Make Each One Readily Accessible for Hanging Utensils

space than several nails, and places every article within easy reach as well as providing individual hooks for all the pieces.

The rack is easily made of a block of wood, $2\frac{1}{2}$ in. in diameter and 1 in.

thick; an arm, $\frac{3}{4}$ in. wide, $\frac{1}{4}$ in. thick and 6 in. long, and a metal bracket. The arm is fastened to the bracket and the bracket to the wall. A screw is turned through a loose-fitting hole bored in the end of the arm and into the disk. Screw hooks are placed around the edge of the disk as hangers.—Contributed by A. R. Moore, Toronto, Can.

Homemade Hinges for Boxes

A very simple form of hinge can be made as shown in the sketch. It is merely a matter of cutting out two pieces of flat steel, A, punching holes in them for screws or nails, and fastening them to the box corners, one on each side. When the box is open, the lid swings back clear and is out



Hinge Parts Made of Sheet Metal and Their Use on a Box Cover

of the way. A hinge of this kind is very strong. For a light box, the parts can be cut from tin.—Contributed by Chas. Homewood, Waterloo, Iowa.

To Remove Odors from Ice Boxes

An easy way to prevent odors in an ice box is to place a can of coke in the box. This will take up all gases and prevent milk from tasting of onions or vegetables which may be kept in the box.

In factories where bad odors are apt to spoil the men's lunches put up in pails or baskets, a box can be constructed to hold these receptacles and a large pail of coke placed in it. Anything placed in this box will remain free from odors, and fresh.—Contributed by Loren Ward, Des Moines, Iowa.

How to Build a Wind Vane with an Electric Indicator

Quite often it is practically impossible to ascertain the direction of the wind by observing an ordinary wind vane on account of the necessity of locating the vane at such a height that it may give a true indication. By means of the device shown in Fig. 2, the position of the vane may be determined without actually looking at the vane itself and the indicating device may be located almost anywhere and independently of the position of the wind vane.

The principle upon which the device operates is that of the Wheatstone bridge. The position of the moving contact A, Fig. 1, is controlled by the wind vane. This contact is made to move over a specially constructed resistance R, Fig. 2. A second movable contact, B, is controlled by the observer and moves over a second resistance, identical with that over which the contact A moves. These two resistances are connected so as to form the two main branches of a Wheatstone bridge; the points A and B are connected to the current-detecting device, which may be a galvanometer or telephone receiver, and current is supplied by a number of dry cells.

In order to obtain a balance—that is, no current through the receiver—the points A and B must occupy corresponding positions on their respective resistances. If the two resistances over which the points A and B move are mounted in the same position with respect to the cardinal points of the compass, then the points themselves will always be in the same position with respect to the cardinal points when a balance is obtained. The arrow head on the wind vane and the point A are made to occupy corresponding positions, and hence the position of the point B, when no current passes through the receiver, is an indication of the direction in which the wind vane is pointing.

The principal parts in the construction of the device are shown in the il-

lustration, and the following description of their construction may be of interest to those who contemplate building the indicator.

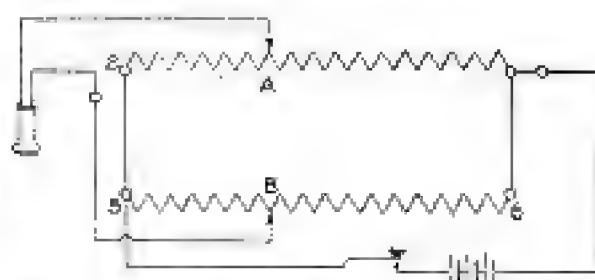


Fig. 1—The Diagram of a Wheatstone Bridge Which Shows the Points of Contact So Placed That a Balance is Obtained

Procure two pieces of $\frac{1}{8}$ -in. hard rubber, $1\frac{1}{2}$ in. wide by 24 in. long. Clamp these, side by side, between two boards and smooth down their edges and ends, and then file small slots in the edges with the edge of a three-cornered file. These slots should all be equally spaced about $\frac{1}{8}$ in. apart. Have the pieces clamped together while filing the slots and mark one edge top and one end right so that the pieces may be mounted alike. Now procure a small quantity of No. 20 gauge bare manganin wire. Fasten one end of this wire to one end of the pieces of rubber by winding it in and out through three or four small holes and then wind it around the piece, placing the various turns in the small slots that were filed in the edges. After completing the winding, fasten the end just as the starting end was attached. Wind the second piece of rubber in a similar manner and make sure to have the length of the free ends in each case the same. Obtain a cylinder of some kind, about 8 in. in diameter, warm the pieces of rubber by dipping them in hot water, bend them around the cylinder and allow them to cool.

A containing case, similar to that shown in cross section in the upper portion of Fig. 2 should now be constructed from a good quality of tin or copper. The inside diameter of

this case should be about 1 in. more than the outside diameter of the resistance ring R, and it should be about 3 in. deep. The top C may be made

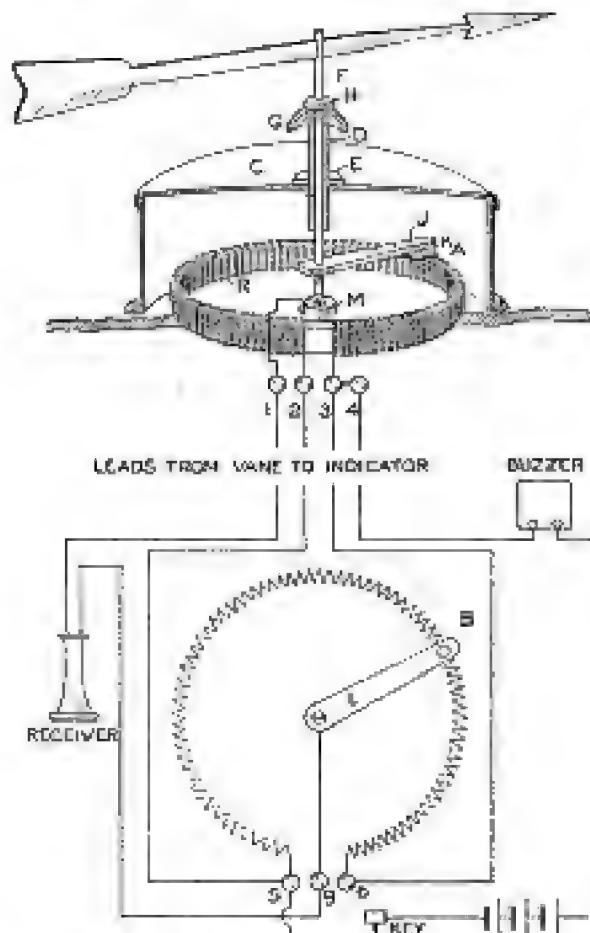


Fig. 2—The Weather Vane with Resistance Cell, and Diagram of Indicator Which is Identical with That of the Vane.

curved as shown in the illustration, and should be fastened to the case proper by a number of small machine screws. The base of this case may be made so that the whole device can be mounted on the top of a pole.

Mount a piece of $\frac{1}{4}$ -in. steel rod, about $\frac{1}{2}$ in. long, with a conical hole in one end, in the center of the bottom of the case as shown by M. A number of supports, similar to the one shown, should be made from some $\frac{1}{4}$ -in. hard rubber and fastened to the sides of the case, to support the resistance ring. The dimensions of these supports should be such that the ends of the piece of rubber, forming the ring, are against each other when it is in place. The upper edge of the ring should be

about 2 in. above the bottom of the case.

Next, mount a piece of brass tube, D, in the exact center of the top and perpendicular to it. A washer, E, may also be soldered to the top so as to aid in holding the tube. Procure a piece of steel rod, F, that will fit in the tube D and turn freely. Sharpen one end of this rod and mount a brass wind vane on the other end. A small metal cup, G, may be soldered to a washer, H, and the whole mounted on the steel rod F in an inverted position as shown, which will prevent water from getting down inside the case along the rod. The cup G may be soldered directly to the rod. Make a small arm, J, of brass, and fasten a piece of light spring, K, to one side of it, near the outer end, then mount the arm on the steel rod so that it is parallel to the vane and its outer end points in the same direction as the arrow on the vane. The free end of the light spring on the arm J should be broad enough to bridge the gap between adjacent turns of wire on the resistance ring. Four bindings should then be mounted on the inside of the case and all insulated from it with the exception of number 1. Numbers 2 and 3 are connected to the ends of the winding and number 4 is connected to number 3.

A second outfit should now be constructed, identical with the one just described except that it should have a flat top with a circular scale mounted on it, and the arm L should be controlled by a small handle in the center of the scale. The position of the contact B may be indicated on the scale by a slender pointer, attached to the handle controlling the arm L.

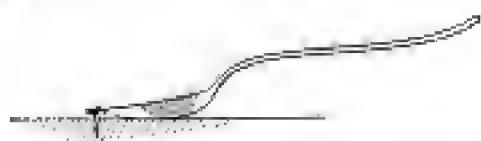
Four leads of equal resistance should be used in connecting the two devices and the connections made as shown. An ordinary buzzer placed in the battery circuit will produce an interrupted current through the bridge circuit and a balance will be obtained by adjusting the contact point B until a minimum hum is heard in the telephone receiver.

Cleaning Clothes by Boiling Them

When cleaning clothes by boiling them in a boiler over a fire, fit in a false bottom to keep the clothes from touching the bottom. The false bottom should be perforated with holes, $\frac{3}{8}$ -in. in diameter and 1 in. apart, over the entire piece. Fasten four legs, each about 2 in. long, to the under side to make a space between the bottoms. In washing, all that is necessary is to place the clothes in the boiler and boil them. The dirt will come loose and settle through the holes and on the boiler bottom.

An Emergency Tack Puller

One day I had to pull some tacks but had no tack puller at hand. An idea came to me to use the kitchen



The Point of a Spoon will Readily Pull a Tack from Soft Wood

spoon, and I found that it worked even better than a regular tack puller. The ordinary kitchen spoon usually has an edge sharp enough to get under any tack.—Contributed by H. D. Harkins, St. Louis, Mo.

A Puzzle with Figures

This puzzle is to arrange all the figures or digits, from 1 to 9 inclusively, in two rows, each containing all the digits, so that the sum in addition as well as the remainder in subtraction will have nine figures, in which all the digits are represented. There are several solutions to the puzzle, and the following is one of them:

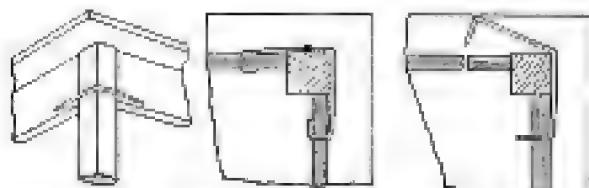
371294568

216397845

The sum of the foregoing numbers and the remainder, when the lower row is subtracted from the upper, will both have nine figures and include all the digits from 1 to 9.—Contributed by Walter Bennett, Detroit, Mich.

To Fasten Loose Table Legs

When legs of an ordinary table become loose and unsteady they may be easily repaired as shown in the sketch.



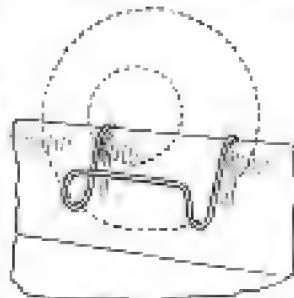
A Piece of Wire Bent around the Leg of a Table will Make It Rigid

Nails do not hold well in such places and glue will not stand much washing.

The method of making the repair is to drill $\frac{1}{8}$ -in. holes through the rails on each side of the leg and insert pieces of galvanized wire of a size to fit the holes. After the wire is inserted, the ends are bent over. The illustration clearly shows the repair.—Contributed by Edwin C. Wright, Newport, Ky.

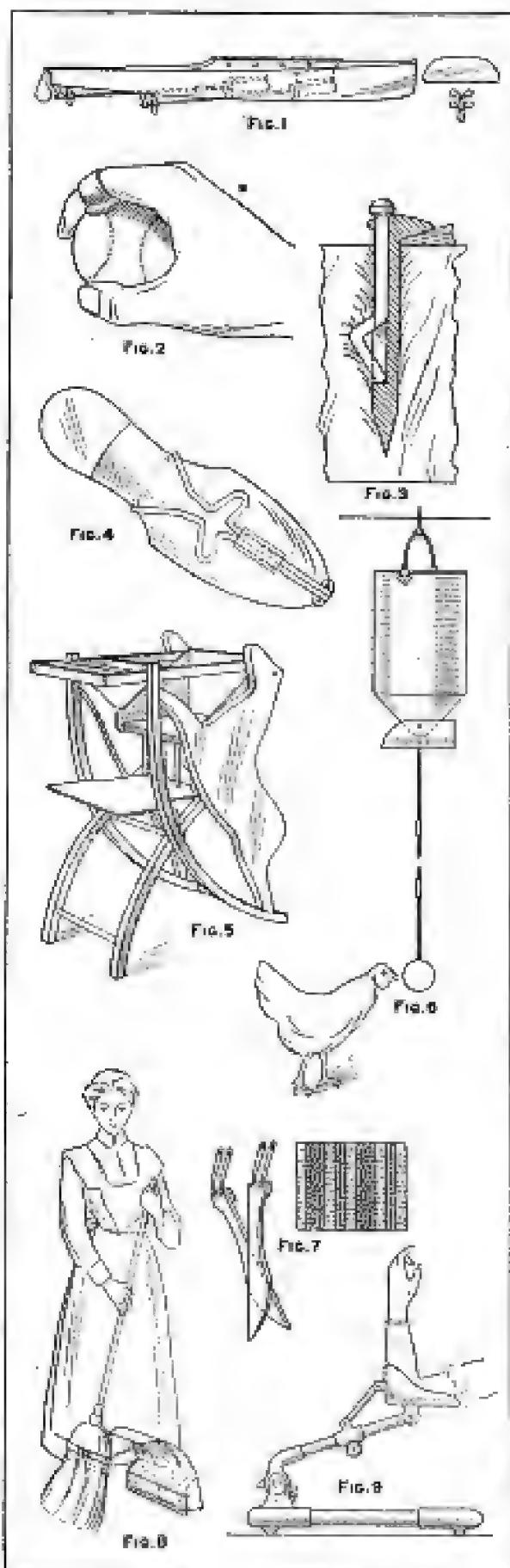
Washbasin Holder

A piece of wire formed into the shape shown in the sketch makes a handy hook to hold a washbasin when it is not in use. This keeps it out of the way and out of the dirty water which might be thrown into the kitchen sink.—Contributed by F. C. Althen, Anamosa, Iowa.

**A Cleaner for Canvas Shoes**

One of the most economical cleansers for canvas shoes is oxide of zinc. Mix a small quantity of the powder with water, to the consistency of thin paste, and apply it to the canvas with an old toothbrush, rubbing it in thoroughly. Then set the shoes aside to dry before wearing them.—Contributed by Katharine D. Morse, Syracuse, N. Y.

A good substitute currycomb can be made of corncobs tied together tightly.



INTERESTING PATENTS,

DOUBLE - PROPELLER ARRANGEMENT (British patent)—In Fig. 1 is shown an interesting arrangement of twin hydroplane propellers. The shafts are approximately parallel and in the same vertical plane, one propeller being several feet forward of the other. As shown in the drawing, each propeller is driven by an independent power unit, but a single unit geared to both shafts may be used. The claim is made that the arrangement is particularly applicable to mixed power units, such as the combination of a reciprocating engine and a turbine.

BASEBALL CURVER—The little device shown in Fig. 2 is designed to help the budding baseball pitcher to curve the ball. It consists of a vacuum cup formed of rubber, designed to collapse to a greater or less extent under the pressure of the finger, according to the amount of curve desired. It is slipped over the forefinger of the pitching hand.

SELF-LOCKING RAIL SPIKE—A rail spike that securely anchors itself in the tie when driven into place is shown in Fig. 3. The spike has a longitudinal groove, the end of which is square, and in this groove is a key provided with notches on opposite faces, so that when driven into the groove it will bend out laterally in V shape.

EXTERNAL SHOE-TREE (British patent)—Figure 4 illustrates a shoe-tree designed for external application. It is made from spring-steel wire, bent to the shape shown, and provided with clips adapted to engage the top edge of the sole at the toe and instep. The tension of the arms of the device is adjusted by means of a tubular runner.

COMBINED HOBBYHORSE AND HIGH CHAIR—Figure 5 shows an interesting combination of two articles required in a home where there are small children. During meal time it assumes the form of a high chair, and at other times provides the child with the delights of riding hobbyhorse.

SIMPLE AUTOMATIC POULTRY FEDER—An automatic feeder for poultry, simple in design, yet apparently as practical as similar devices of more complicated and expensive design, is illustrated by Fig. 6. The feeder, which is hung from any convenient support, comprises a grain container provided with a discharge opening at the bottom; a scoop pivoted underneath the opening, and a pendulum-like arrangement with a ball at its end. The chickens peck at this ball, thus causing the pendulum to swing, which tilts the scoop and allows a certain amount of grain to fall to the ground.

HAND-OPERATED KNITTING DEVICE (British patent)—Machine-knit fabrics with twisted ribs, as shown in Fig. 7, may be produced by the use of the hand-knitting device, also shown in the drawing. This consists of two parts pivoted together, or united by pin-and-slot connections, each part being provided with covering points. The rib loops to be transposed are taken off the needles while the covering points remain in line, then the operation of the handles enables the loops to be conveniently replaced in the desired transposed position.

DUST CATCHER FOR BROOMS—In Fig. 8 is illustrated a dust-catching attachment for brooms. The manner of attaching it is clearly shown. A shield is provided to obstruct the flight of the dust, which falls into the dust-absorbing material in the sack at the bottom.

ARM-REST FOR GLOVE FITTING—An adjustable arm-rest, provided with a comfortable saddle upon which the elbow is rested while the glove is being fitted, is shown in Fig. 9. The base of the rest is provided with rollers, so that it may be swung into operative position on the counter.

PRACTICAL OR UNIQUE

SIMPLE SPRING-WINDING MACHINE—In Fig. 10 is shown a spring-winding machine which makes either compression or tension springs of any size from $\frac{1}{16}$ in. to 12 ft. long, using any size wire from No. 26 to 3-16 in. The winder can be attached with a thumbscrew to any bench and is ready to wind any size of spring.

* * *

COMBINED BOOK STRAP AND DRINKING CUP—In these days of the individual drinking cup, the combination shown in Fig. 11 may prove of practical use to students and lovers of books. The book strap has a flexible loop with a flanged cap secured to its center, adapted to receive and engage one end of a collapsible cup.

* * *

JACK FOR TIGHTENING ANTI-SKID CHAINS—A practical device for the motorist's tool kit is shown in Fig. 12 in the form of a jack for tightening anti-skid tire chains. It comprises a main lever portion having a hook-shaped end, an arm, also provided with a hook at its free end and having a series of ratchet teeth arranged about its pivotal point, connected with the main lever portion, and a pawl on the main lever portion for engagement with the ratchet teeth.

* * *

SPRING SWING—Figure 13 illustrates an interesting swing arrangement for children. Attached to the supporting frame are four levers pivotally mounted relative to each other, two levers extending in one direction and two in the other. The ropes supporting the swing-seat pass through the upper lever ends and are attached to the lower ones, and the weight of the person swinging tends to draw the levers together, thus giving a springy action and considerably extending the swinging period.

* * *

NAIL-PULLING ATTACHMENT—An additional attachment for the ordinary type of nail-pulling hammer head, designed to aid in the extraction of long nails, is shown in Fig. 14. In pulling long nails with an ordinary hammer it is usually necessary, when the nail has been partially pulled, to place a block under the hammer head to provide a higher base for leverage, and it is to provide such a raised base without the necessity of finding a block that the attachment has been designed.

* * *

MARCHING COMPASS (British patent)—In Fig. 15 is shown a device by means of which troops marching at night through open country can determine the direction of march and maintain it. The device, which is called a marching compass, comprises a graduated disk with a central sight-carrying arm and two other arms, which are so set in relation to one another that when the north star is sighted over the central sight and one of the peripheral sights, the line between the former and the remaining sight gives the direction of march. A mirror may be used instead of one of the sighting arms.

* * *

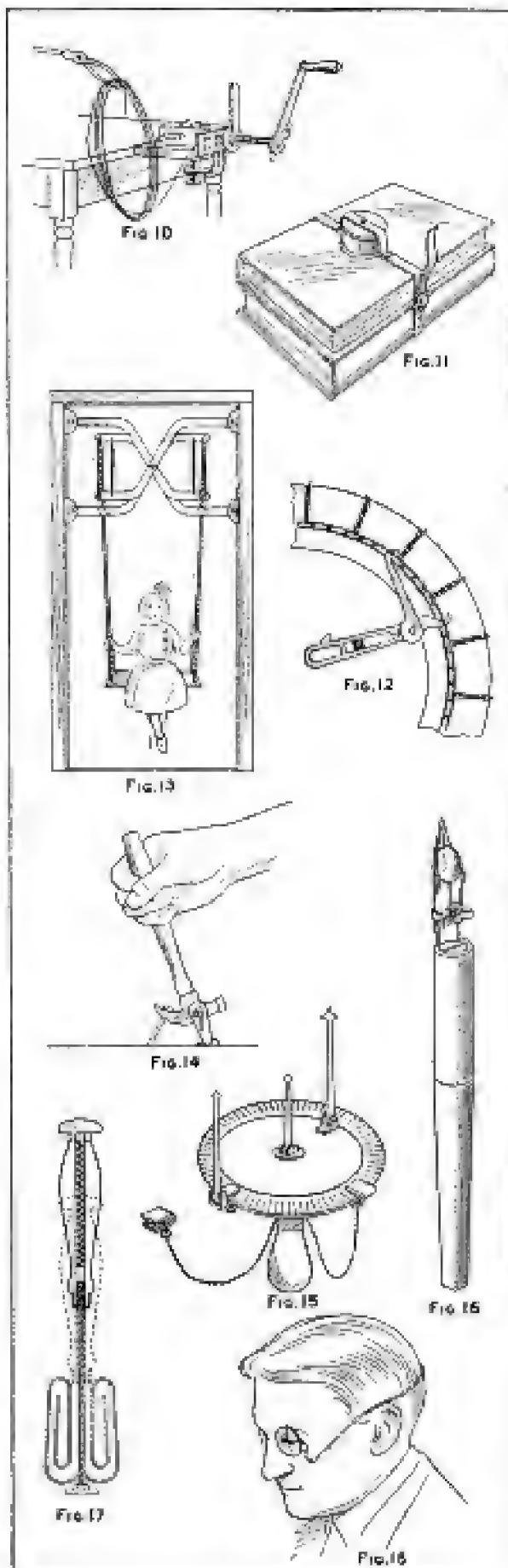
RESERVOIR ATTACHMENT FOR PENS—An ink fountain, designed to convert the ordinary pen into a semi-fountain pen, is shown in Fig. 16. The attachment comprises a cup attached to the nib of the pen as illustrated. The pen is dipped in an inkwell or bottle in the usual way and held there long enough for the cup to fill, after which the writing may be continued for a considerable period before another dip into the ink is required.

* * *

PRESSURE-OPERATED EGG-BEATER—Figure 17 shows an implement for beating eggs, whipping cream, and mixing ingredients, which is operated in a similar manner to the spiral-spiral screwdriver or drill-head. The pushing down of the handle causes the vanes to revolve rapidly.

* * *

BRIDGELESS EYEGLASSES—In the eyeglasses shown in Fig. 18 the bridge is entirely done away with, the lens being held in position by a metal band passing completely around the head. When only one side of the face is viewed, the glass has an appearance very similar to that of a monocle.



POPULAR MECHANICS

AT a concert for charity in a country town, Miss Carter obliged by reciting "The Village Blacksmith." At the conclusion of her recital the rural audience cheered.

"Answer!" they cried. "Answer!"

Miss Carter was about to grant the request when a burly fellow very much out of breath tapped her on the shoulder.

"I've just come round from in front," whispered the man excitedly. "I want you to do me a favor."

"Well, what is it?" queried Miss Carter.

"It's this," whispered the intruder. "I happen to be the fellow you've been talkin' about, and I want you to put in a verse this time sayin' as how I let out bicycles."

First Farmer—Now, what do you suppose that old hen is eating them ticks for?

Second Farmer—Perhaps she's goin' to lay a carpet!

A certain company promoter once built a castle on a mountain peak. As he showed the gray Medieval looking pile to a friend, he said:

"I don't know what to call it. What name do you advise?"

"It looks like those Scotch castles in the Highlands," said the friend. "Why not call it Dunrobin?"

"Dunrobin? Dunrobin? Yes, that would be a good name," said the millionaire; "only, you see, I have no intention of retiring yet."

Teacher—Archibald, what plants flourish in excessive heat?

Archibald—Ice plants.—Judge.

A certain millionaire bought a Raphael in Rome. The Italian law prohibits the exportation of masterpieces, and the buyer had the happy idea of getting the Raphael painted over. This was accordingly done. The rare old painting reached London in the guise of a modern snow scene.

Then a restorer, under the watchful owner's eyes, set to work on it. With a sponge dipped in turpentine he proceeded to sponge the snow scene off. He sponged it off readily, but he sponged a bit of the Raphael off too,—and behold, underneath the Raphael a portrait of Marconi was revealed—*London Opinion*.

True Economy—Friend—Why do you wear those fearfully old-fashioned collars? Winkers (a man of affairs)—Because, when the washerwoman sends them to anybody else they send them back.—*Foster, in New York Weekly*.

An aviator descended in a field and said to a rather well-dressed individual: "Here, mind my machine a minute, will you?"

"What?" the well-dressed individual snarled. "Me mind your machine? Why, I'm a United States Senator!"

"Well, what of it?" said the aviator. "I'll trust you."—*Argonaut*.

The Boss Barber—What? You have cut the gentleman four times? Well, just for punishment, you must shave him all over again, right away!—*Elgin Daily Courier*.

A well-known Scotch architect was traveling in Palestine recently, when news reached him of an addition to his family circle. The happy father immediately provided himself with some water from the Jordan to carry home for the christening of the infant, and returned to Scotland.

On the Sunday appointed for the ceremony he duly presented himself at the church, and sought out the beadle in order to hand over the precious water to his care. He pulled the flask from his pocket, but the beadle held up a warning hand, and came nearer to whisper:

"No the noo, sir; no the neeb! Maybe after the kick's oot!"

"That Jones boy who used to work for you wants to hire out to me. Is he steady?"

"Steady? If he was any steadier he'd be motionless."—*Judge*.

It was a divorce case, and the detective witness came to the stand dressed in black broadcloth, wore a gold foil and seals, and looked much more like a respectable middle-aged solicitor than a member of the police force. The man's testimony was damaging to his client, so the learned counsel began his cross-examination very gently and was excessively polite.

"I believe you are John Blank, of the firm of Blank & Co., the eminent detectives?"

"Yes, sir," said the witness, "I represent that firm."

"And I presume," continued the counsel, "that in the course of your duties as a detective you have, at times, to assume many disguises?"

"Yes, sir."

"Then," said the counsel, smiling, "will you have the goodness to tell the court just what you are disguised as now?"

"Outer name," remarked the editor.

"Yes, it might belong to either a parlor car or a Russian dancer."—*Satire*.

Herbert stood on a chair. The chair stood in the pantry. The jam stood on the shelf. Herbert's mother stood on the threshold. Herbert stood his ground. "My son," said the mother, pointing at him with astonishment, "I am surprised! To think that my little boy would do a thing like that!" Herbert, resolute and not at all abashed, looked his mother straight in the eye. "Please do not interfere with the misdeavors of a boy scout," he said. "A boy scout?" "Yes, mother, after supplies."

Kicker—What is Jones trying to invent?

Bucker—A banana peel that won't skid.—*Judge*.

"What you need, madam, is oxygen. Come every afternoon for your inhalations. They will cost you \$4 each."

"I knew that other doctor didn't understand my case," declared the fashionable patient. "He told me all I needed was plain fresh air."—*Washington Herald*.

"What's that big iron thing?" asked Lausp.

"Locomotive boiler," replied Tom.

After a moment's silence, Laura inquired, "Why do they boil locomotives?"

"To make 'em tender!" said Tom.—*Santa Fe Employee's Magazine*.

"What be these?"

"Talking machines, you rub. Drop a nickel in the slot and the machine will talk to you."

"By heck, I'd do it, if I thought I could git a civil answer."—*Washington Herald*.

"What's the matter with that friend of yours? He acts like a crazy man."

"He's all right, only you see he's from Central America and every time he hears a motorcycle he thinks a revolution has been started."—*Chicago Record-Herald*.

Lady (to tramp who had been commissioned to find her lost poodle)—The poor little darling, where did you find him?

Tramp—Oh, a man had 'im, miss, tied to a pole, and was cleaning the windows wiv 'im!

Boy—I want another box of pills like I got for mother yesterday.

Druggist—Did your mother say they were good?

Boy—No; but they just fit my air-guns.



The "Akron" Anchored over the Shore at Atlantic City on the Day of Her First Flight.
The Lifeboat is Shown in Position under the Car

THE END OF THE AMERICAN ATTEMPT TO CROSS THE ATLANTIC BY AIRSHIP

The bursting of the trans-Atlantic airship "Akron" while flying 1,000 ft. above the ocean at Atlantic City, early on the morning of July 2, killing Melvin Vaniman and his crew of four men, shocked the American public more than any other aerial accident in the past year or two. It came shortly after a number of fatal aeroplane accidents, Miss Harriet Quimby, the first American woman to receive an air-pilot's license, and her passenger, W. A. P. Willard, falling to their death the previous day at Boston.

The disaster to the "Akron" was the ending of the trans-Atlantic aerial voyage first planned by Walter Wellman, after his final unsuccessful attempt to fly to the North Pole in 1909. Melvin Vaniman was Wellman's chief of staff in the North Pole attempt, and also in the unsuccessful attempt to cross the Atlantic in the "America" in 1910. In this, the first of the trans-Atlantic attempts, the airship was in the air $7\frac{1}{2}$ hours and traveled approximately 1,000 miles, the crew

abandoning it at a point about 375 miles out from the Atlantic coast, directly east of Cape Hatteras.

Both Vaniman and Wellman retained their enthusiasm and said they would try again, building another airship in the construction of which they would profit by experience. Later, however, Wellman withdrew and Melvin Vaniman went on with the project alone.

When the "Akron" started on its fatal flight, July 2, the atmospheric conditions seemed exceptionally favorable. Vaniman appeared to have complete control, and, after circling about over the inlet and the mainland, pointed the ship's nose out to sea. To those who had witnessed the many flights of Vaniman this one promised at the start to be more successful than any before attempted.

When at an altitude of about 1,000 ft., a sudden puff of smoke was seen at one end of the gas bag. In a minute the bag exploded, a mass of flames hid the ship from view, then the car broke away from the envelope,

and plunged downward. In the descent something which appeared to be the body of a man shot out to the left of the wreckage and struck the water before the rest of the descending mass.

One theory of the cause of the explosion is that somebody let too much free gas into the engines and backed up the exhaust. This is the idea of Chief Beck of the fire department, who was on hand with his men to help in the launching. He had no idea that anything was wrong until he saw the smoke suddenly change to flame and the entire rear of the bag go up as though by explosion.

Another theory is that a dangling rope of the rigging dragged into the big propellers, whipped up against the stern end of the envelope and snapped off enough of the cone to free the gas, allowing the vapor to sweep into the engines and explode, while other reports ascribe the bursting of the envelope to expansion of the inclosed gas from the heat of the sun.

The "Akron" was 258 ft. long, with an extreme diameter of 45 ft. The framework, with the four engines, cylindrical gasoline tank and cabin,

weighed about 14,000 lb. The fuel tank had a capacity of about 8,000 lb. of gasoline. The lifting power was estimated to be about 26,000 lb., and the engines developed 277 hp. A 100-hp. engine was used for the forward vertical propellers, and two 80-hp. engines for the two sets of orientable propellers, which could be turned from the horizontal to the vertical, to help raise and lower the ship. The remainder of the power plant consisted of a 17-hp. engine and a small dynamo.

HEAT AND WATERPROOF FIREMEN'S SUITS

Special suiting for firemen, claimed to be both water and heat-proof, but otherwise like the ordinary fireman's suit, is manufactured by a sporting-goods concern in Indiana. The suiting is composed of two pieces of cloth cemented together with rubber between. In this way the rubber is kept from exposure to the heat and air, which would act upon it injuriously.



Constructing the Envelope of the Ill-Fated Airship in the Factory at Akron, Ohio. It was the Largest Ever Made in the United States

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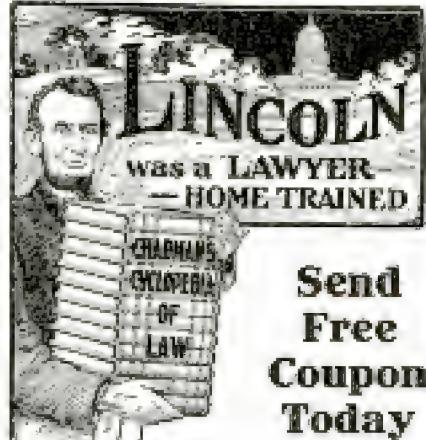
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Pheidippides, the most noted runner of ancient Greece, made a record and an everlasting reputation by speeding 140 miles from Athens to Sparta in less than two days.

Runners trained to perfection composed the courier service for the transmission of messages in olden times. But the service was so costly it could be used only in the interest of rulers on occasions of utmost importance.

The Royal messenger of ancient times has given way to the democratic telephone of to-day. Cities, one hundred or even two thousand miles apart, are connected in a few seconds, so that message and answer follow one another as if two persons were talking in the same room.

This instantaneous telephone service not only meets the needs of the State in great emergencies, but it meets the daily needs of millions of the plain people. There can be no quicker service than that which is everywhere at the command of the humblest day laborer.

Inventors have made possible communication by telephone service. The Bell System, by connecting seven million people together, has made telephone service so inexpensive that it is used twenty-five million times a day.

Captains of war and industry might, at great expense, establish their own exclusive telephone lines, but in order that any person having a telephone may talk with any other person having a telephone, there must be One System, One Policy and Universal Service.

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Every Bell Telephone is the Center of the System

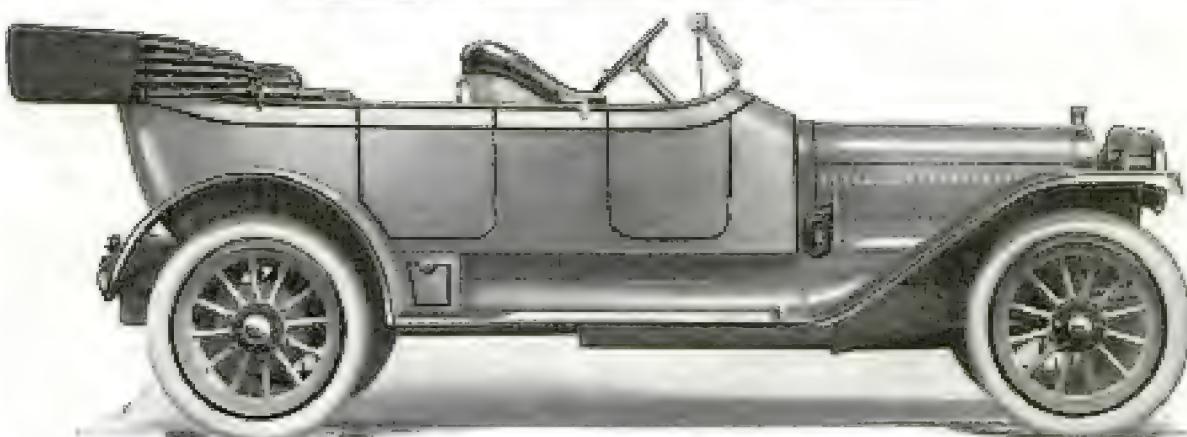
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WINTON SIX

1913

**In a Class All Its Own**

The \$3000 48 H. P. Winton Six has no competition below \$4000 and no superior at any price. Now in its sixth year of growing popularity, this car differs from all other cars. Note that:—

1—It is *the* car that, single-handed and alone, overcame the opposition of practically the entire industry and converted high-grade makers and users from four-cylinder cars to Sixes.

2—It is the one high-grade car that in five consecutive years has not required a single radical alteration.

3—It is the *only* car of wide reputation that has *always* had a self-cranking motor. (June, 1907 to date.)

4—It is *the* Six whose makers were the first in the world to make Sixes exclusively.

5—It is the *only* car whose repair expense record is proved by the sworn statements of individual owners. In 744,000 miles of travel during four years the Winton Six established the wonderful repair expense record of 22.8 cents per 1000 miles.

6—It is a car that owes its success to *no* racing or endurance test stunts, to *no* pretty picture or poetical advertising, to *no* social prestige fallacy, and to *no* super-price sophistry. But has won its supremacy by proving itself able to give its owners the finest, pleasantest, and surest kind of service, every day, year after year. Men who buy Winton Six cars *keep them*. You'll find Winton Six owners the hardest men in the world to win over to other makes.

7—You can buy the ideal Winton Six at \$3000, because we do business on sound, rock-bottom business principles. We buy materials

for cash. We own our entire plant and equipment. We owe nobody anything. We are not loaded down with bond, mortgage or gold note obligations with interest and sinking fund requirements that cost hundreds of dollars per car. In buying a Winton Six you escape all these super-charges. Also we save you the \$200 dealer's discount that you would pay on a \$4000 car and the \$400 dealer's discount that you would pay on a \$5000 car. If your money is worth face value to you, the price of the Winton Six is *alone* a thing worth thinking about seriously. And you have the assurance of thousands of owners that the \$3000 Winton Six will give you every essential element of car quality, besides the unique advantages stated in paragraphs 1 to 6,—advantages not to be had in *any* other car.

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BOSTON, 67-1 Commonwealth Ave.
PHILADELPHIA, 346-348 N.
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BALTIMORE, Mt. Royal at
North Ave.
PITTSBURGH, Brown at Beatty St.
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DETROIT, 998 Woodward Ave.
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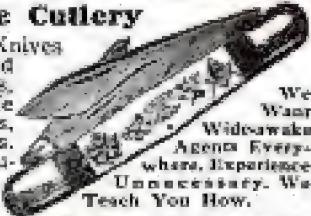
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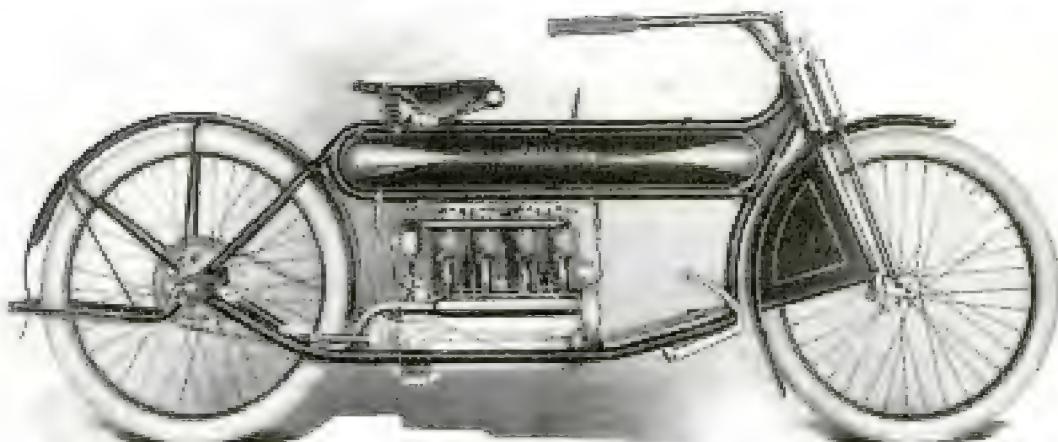
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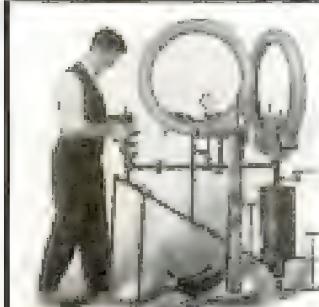
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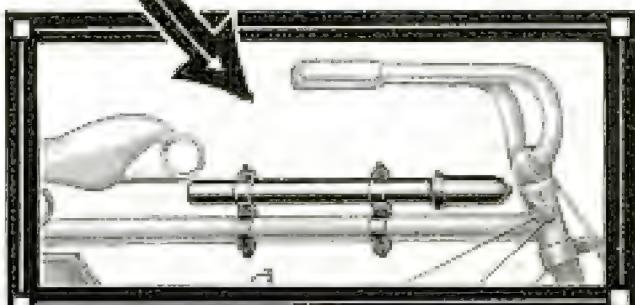
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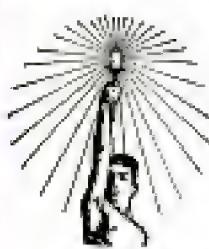
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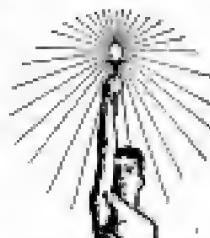
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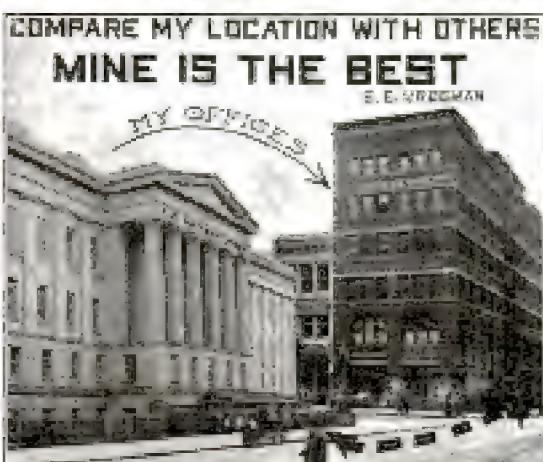
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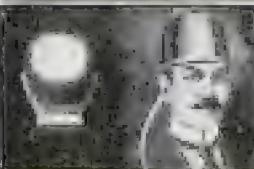


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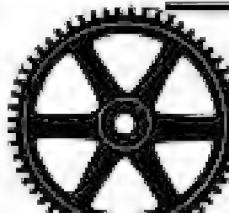
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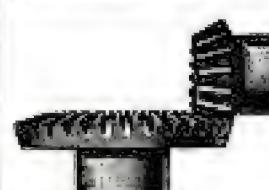
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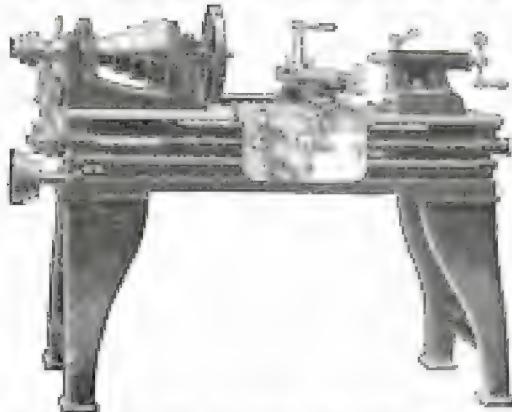


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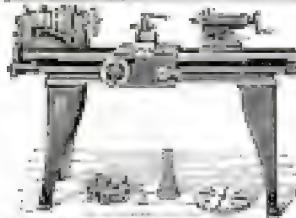
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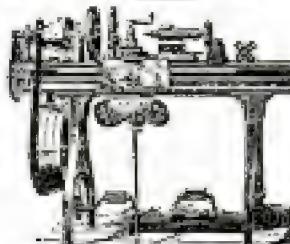
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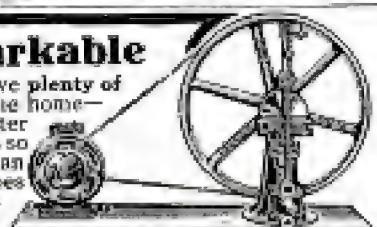
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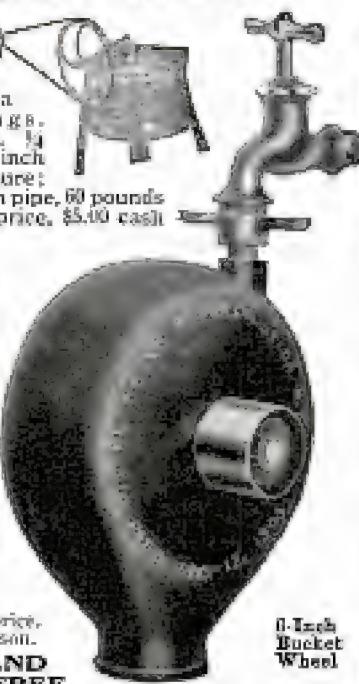
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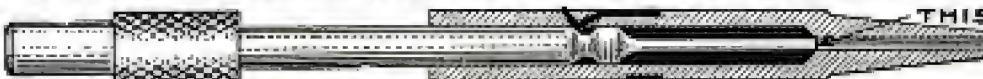
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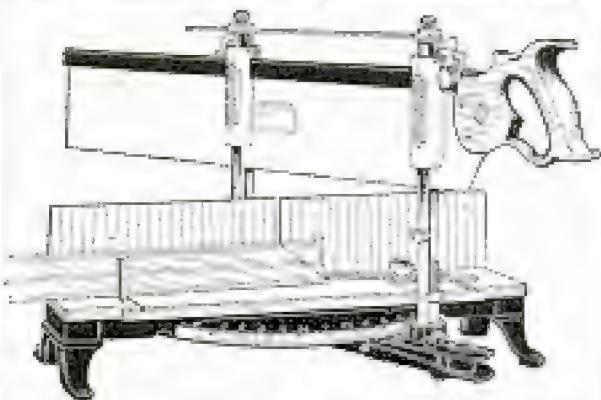
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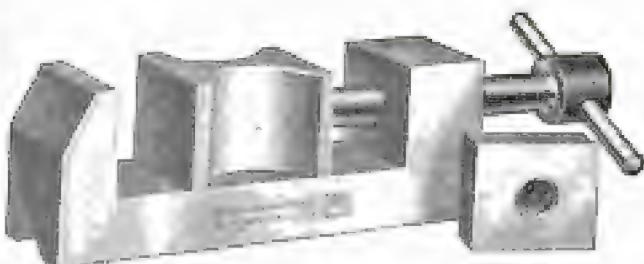
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PROVIDENCE, R. I., U.S.A.

lage was at the depot grounds, canine, feline and humano. Everybody from the wee little tot that couldn't scedle between a sugar plum and a railroad train, to the gray haired fathers and mothers who have seen goods hauled through here from Philadelphia to Nashville on greaky, cumbersome wagons. The interest did not simply consist in gazing at an engine followed by half a dozen passenger cars, but that in fact our railroad was a thing of life, it had been born and all gazed on the infant. One glance was sufficient; it was assuring, it told all they wanted to know.—Engineering and Contracting.

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This is an Improved Ratchet Brace that will meet every requirement of a brace of this kind. The Chuck will hold both round and square shank bits and has forged jaws.

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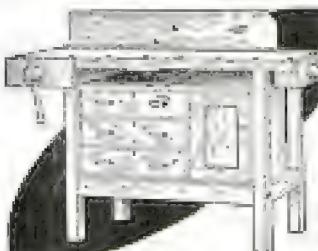
MERITS OF CRUST VS. CRUMB ANALYZED SCIENTIFICALLY.—Lay discussions not infrequently turn upon the relative merits of the crust and crumbs of bread, says the *Lancet*, and the master is often re-

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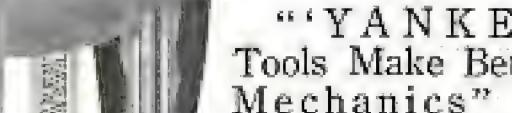
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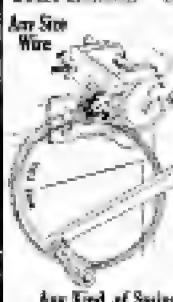
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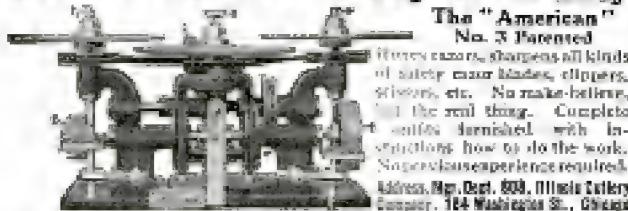
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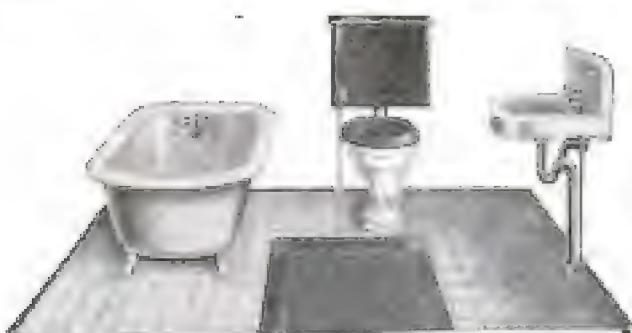
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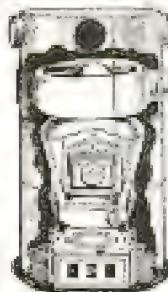
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"Eus" Edwards, comedian and song writer, was playing in the Orpheum Theater at that city some weeks ago. During his stay he received a message from the owner of the musical comedy, "Over the River," in which Eddie Foy now is starring in New York City. The theatrical magnate stated that he needed a new song for

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A 200 Candle Power Lamp for Home, Store, Shop, work bench, library desk, or whatever a stand lamp can be used. Can be hung up and down like a chandelier and with more safety than a kerosene lamp, and uses 15 times the lightest fuel than any coal or oil lamp. We have 6 different lines of lamps, including wall sconces and lamps, table lamps for sitting rooms and lamps for bedrooms. For instant income in most attractive styles at less than 3-1/2 the cost of gas or electricity. Our POP Catalog tells all about them. Get it now and decide which fits you best.

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Such a demand would put an ordinary song writer completely out of business. Not so Edwards. He had a reputation for versatility to uphold. He accepted the contract unconditionally. The same night, after finishing his day's work at the theater, he went to his hotel, sat down at a table and wrote the entire music for the song.

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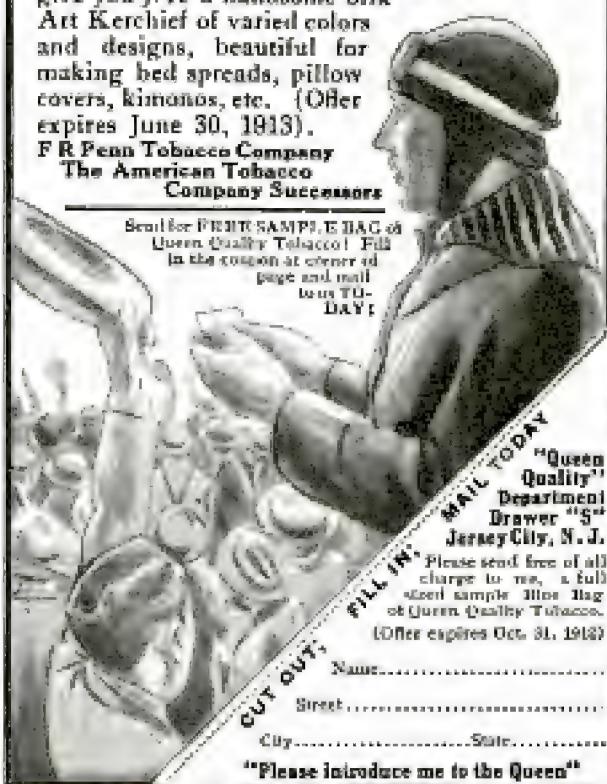
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right, but I need help on the words. Will you take the job?"

"Sure," answered Cobb. "Can you give me a couple of weeks?"

"Couple of weeks nothing!" shouted Edwards. "This thing must be done right off the bat. It's a case of rush. Can't you jump on the next train and come over here to Harrisburg?"

"Not on your life," said Cobb. "my desk is stacked

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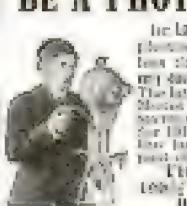
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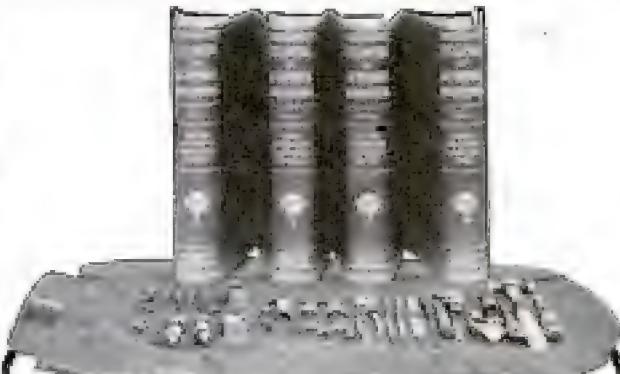
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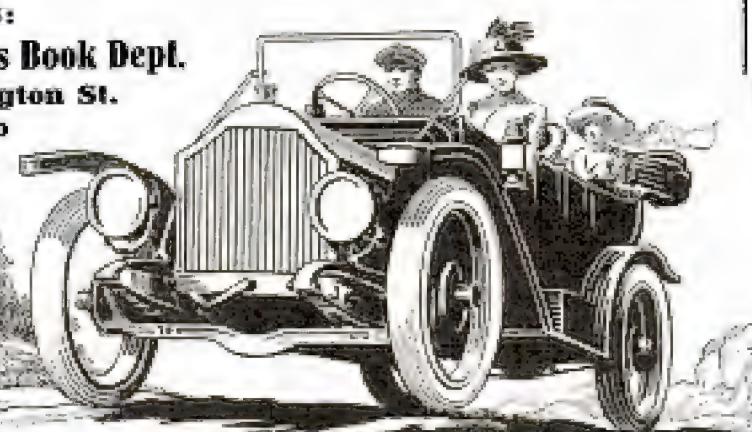
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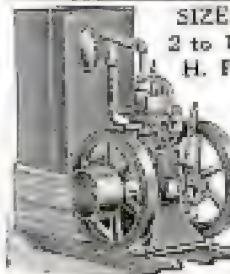
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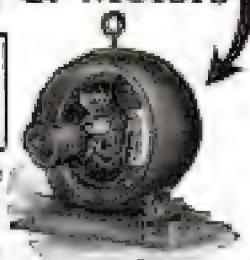
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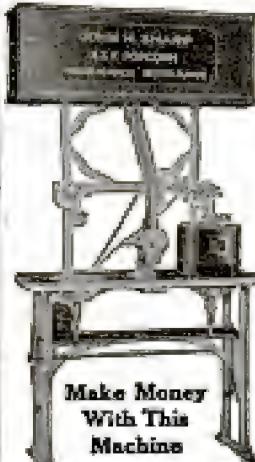
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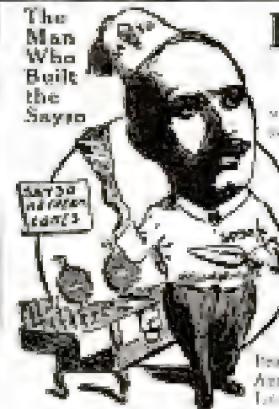


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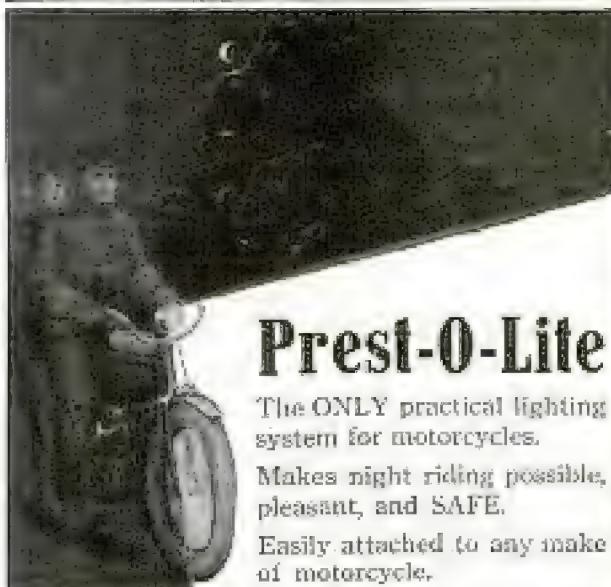
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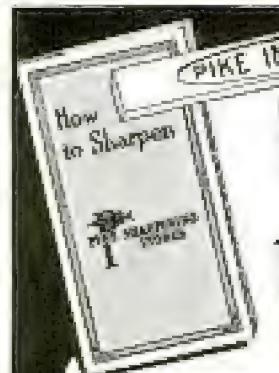
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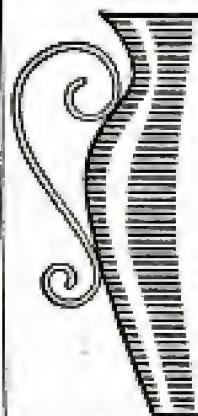
The telegraph lines for hundreds of miles about Chengtu have been cut down, and the wire has been used to wrap oak logs that have been hollowed out and are being used for cannon by the rebels.

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Doctor Beech says the hundreds of wounded soldiers brought into the city attest to the deadliness of the telegraph as an auxiliary of warfare of which westerners never dreamed.—*New York Herald*.

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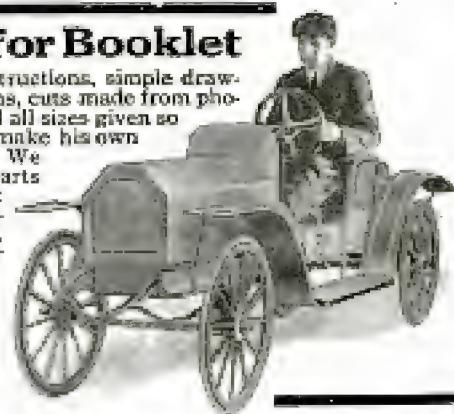
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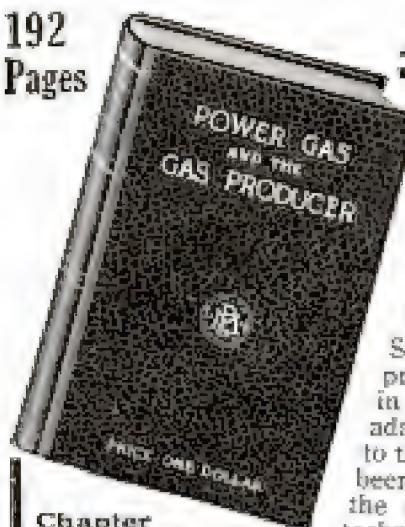
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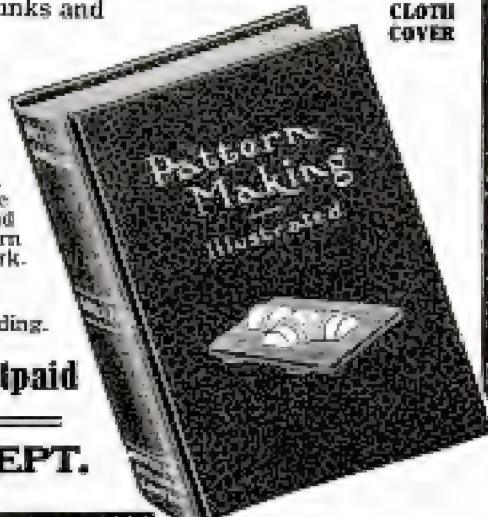
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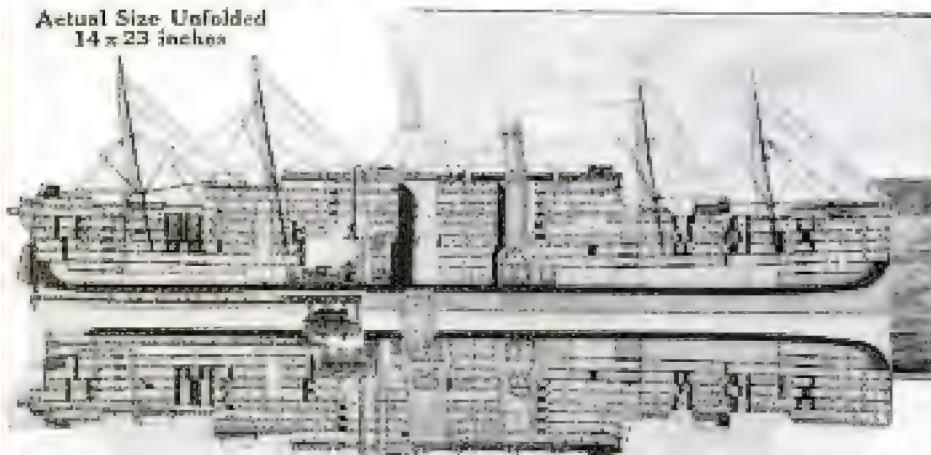
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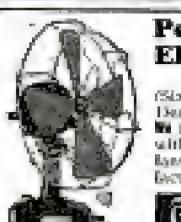
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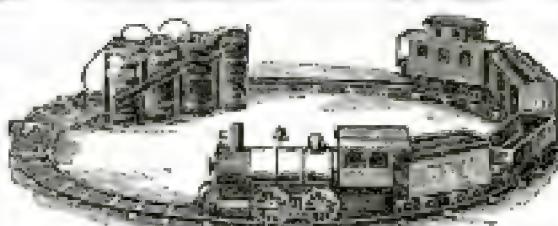
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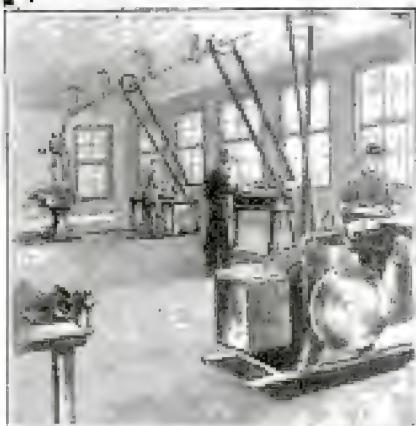
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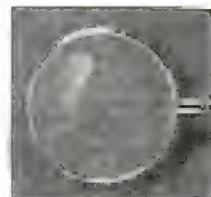
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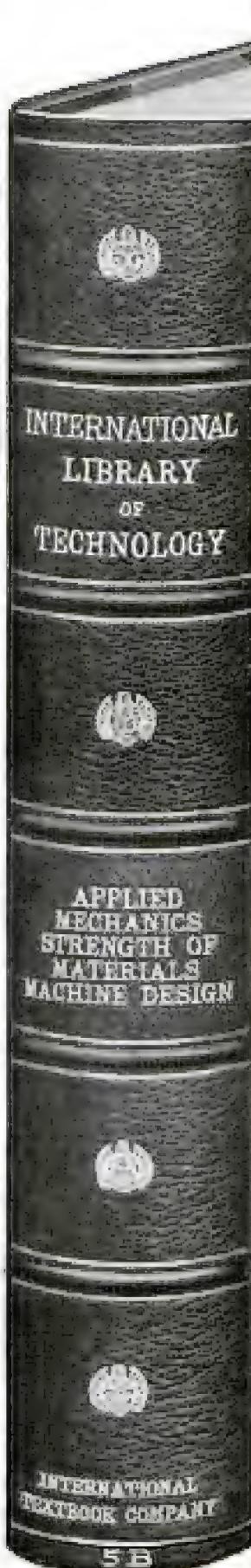
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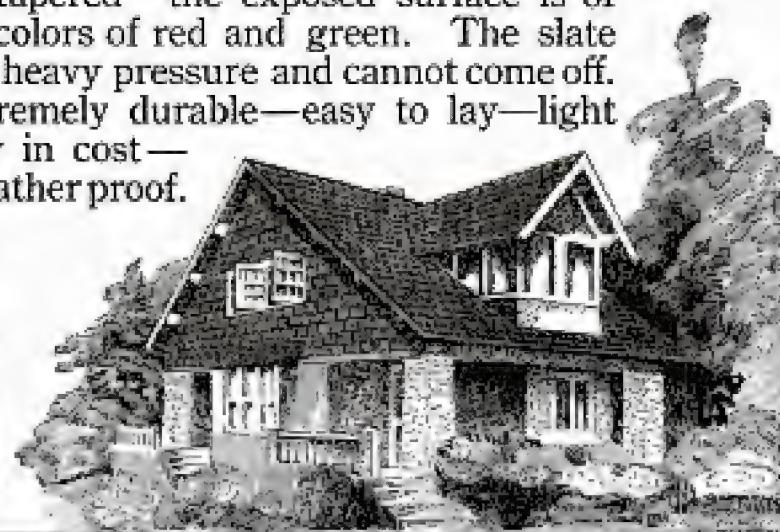
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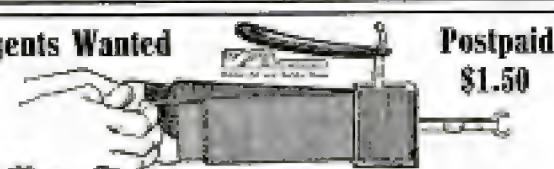


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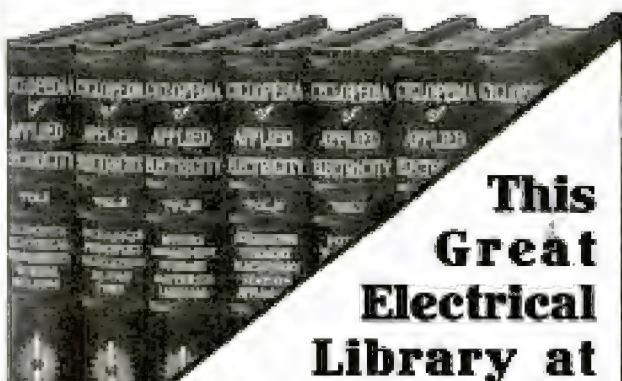
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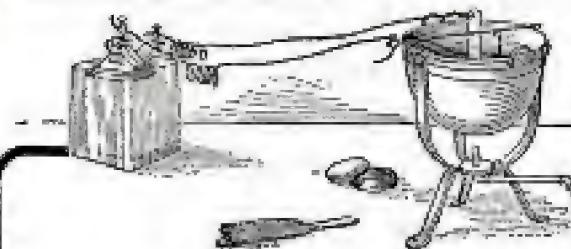


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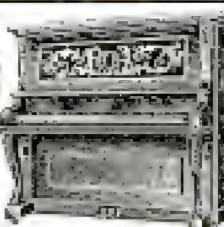
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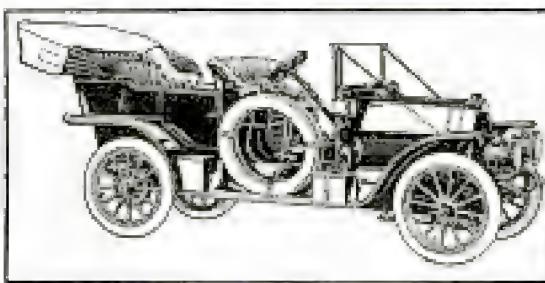
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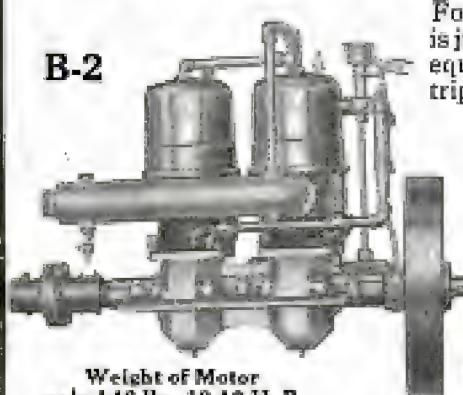
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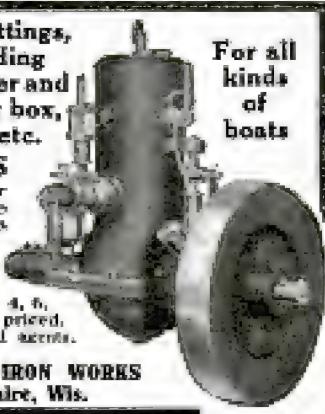
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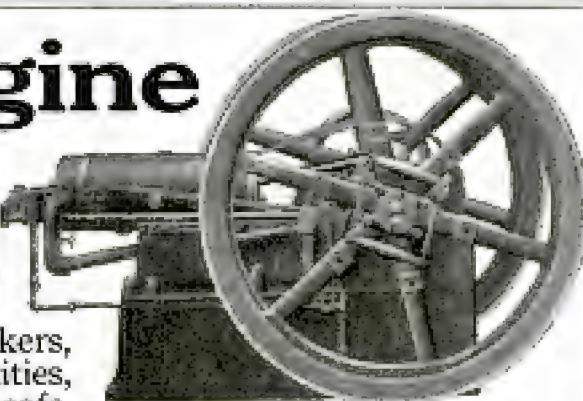
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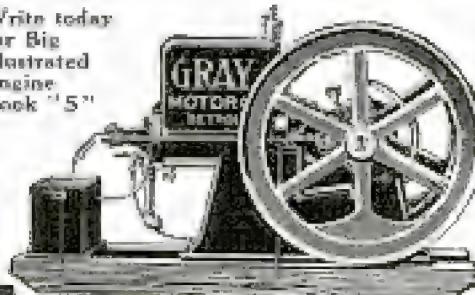
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Book "5"



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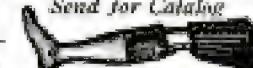
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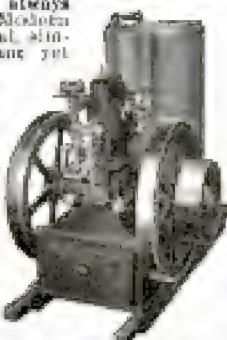
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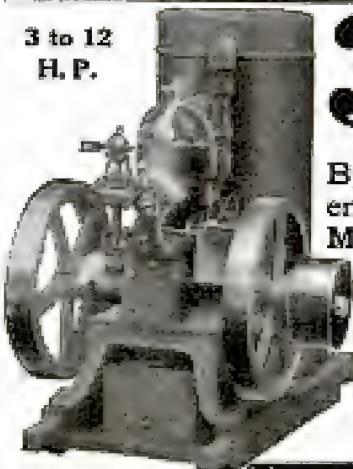
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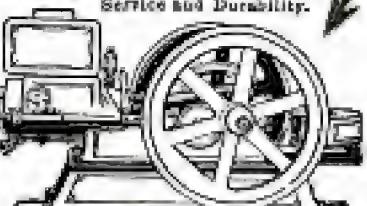
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asking why, and this is that paper's answer:
 In taking a moving picture there are, perhaps, 16 exposures made each second. If, now, the spokes of the wheel of a carriage move with a speed so that the spokes are in the same position at each exposure, that wheel will seem to stand still in the picture. If the wheel

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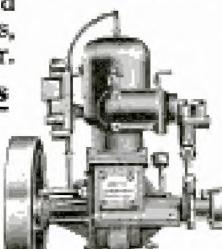
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moving slower, then the spokes will be seen further backward in the successive views and the wheel will seem to turn backward, while it will seem to turn forward when the spokes move fast enough to occupy positions further forward in each exposure. It is a matter of the interruption for the exposure and the motion of the wheel. If there are 16 exposures and the wheel turns through the space between two spokes in one-sixteenth of a second, the wheel would be in the same position at each successive exposure, and so would not seem to move at all.

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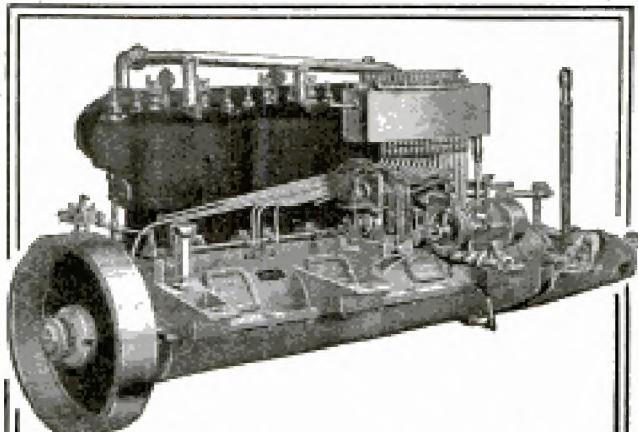
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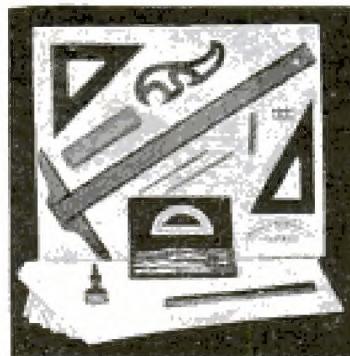
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Eighty tons of structural iron were required for the framework, making necessary six mammoth trusses to distribute the weight and wind stress over the building.

A mechanical device changes the boy's face and the heading. When he cries the heading reads "I Want Kellogg's." He then smiles and the heading reads "I Got Kellogg's." The sign portrays a true story told in millions of homes daily.

The immensity of this sign can best be appreciated by the picture above showing the sign in course of construction. Look closely and you will be able to make out eighteen men working on the frame.

W. K. Kellogg

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